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A STUDY OF THE COWPEA VALUE CHAIN IN KANO STATE, NIGERIA, FROM A PRO-POOR AND GENDER PERSPECTIVE

GREATER ACCESS TO TRADE EXPANSION (GATE) PROJECT
UNDER THE WOMEN IN DEVELOPMENT IQC

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This report is based on research detailed in "The Potential Effect of Economic Growth and Technological Innovation on Women's Role in the Cowpea Value Chain in Kano State, Nigeria," by J. Lowenberg-DeBoer and Germaine Ibro (2008), a paper commissioned by the GATE Project. The results and conclusions are those of the GATE Project and not the original authors.

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EXECUTIVE SUMMARY

The cowpea is one of the most economically and nutritionally important indigenous African grain legumes produced throughout the tropical and subtropical areas of the world. Cowpeas play a key role in the agriculture and food supply of Nigeria: Nigeria is the largest producer and consumer of cowpeas, accounting for about 45 percent of the world's cowpea production. As of 2004, it was also the world's largest cowpea importer. Kano State is in the heart of the Nigerian "cowpea belt," and cowpeas are grown on almost every farm in Kano State and are eaten in some form by almost every Kano consumer.

From February – June, 2007, under the Greater Access to Trade Expansion (GATE) Project, a Cowpea Subsector Study was conducted to assess the cowpea value chain and provide recommendations on how to enhance the strategy of the Maximizing Agricultural Revenue and Key Enterprises in Targeted Sites (MARKETS) Project by incorporating a pro-poor approach to mitigate the exclusion of or negative impacts felt by the poor, especially poor women. Funded by USAID/Nigeria, the MARKETS Project aims to expand economic opportunities in the agriculture sector by increasing sales and jobs for agricultural-related businesses throughout Nigeria.

METHODOLOGY

The objective of the study was to identify strategies and opportunities for increasing the participation of and benefits to the poor, particularly poor women, through a pro-poor and gender-sensitive analysis of the cowpea value chain in Kano State, Nigeria. This report synthesizes the findings of (1) an extensive literature review on cowpeas for Nigeria and the West Africa region and (2) interviews with a range of actors in the Kano cowpea value chain. Qualitative and quantitative methods of analysis were applied to understand the role and participation of women and other disadvantaged groups in the value chain.

THE COWPEA VALUE CHAIN

The cowpea value chain in Kano State is similar to that throughout most of West and Central Africa; it includes many actors—of which the most important are cowpea producers, farm workers (including family labor), grain merchants, grain retailers, processors, commercial food preparation businesses (formal and informal), and consumers.

Most actors in the cowpea value chain, with the exception of Kano grain wholesalers, are poor. Producers (farmers) and informal vendors particularly cluster in lower income groups. Along the value chain, women have the greatest representation among processors, although the actual number of women involved in farming is undoubtedly larger than that involved in processing. All the vendors of cowpea-based street foods encountered in Kano State were female, and close to 25 percent of those interviewed derive their total household income from the processing activity. For these reasons, improving the profitability of cowpea vendors is likely to have a positive benefit on the poor, particularly poor women.

KEY FINDINGS

Improving the cowpea value chain has the potential to result in pro-poor benefits. Several points in the chain offer opportunities to increase returns to the actors, particularly poor and disadvantaged groups, including women. The recommendations range from working with cowpea varieties to developing market linkages. The MARKETS Project is pursuing interventions in some of these areas.

Cultural, social, and religious practices influence gender roles in Kano State, and any business development or support services should consider these practices. The practice of seclusion (the limited involvement of women in public spheres) is discussed because of its potential impact on the economic activities of women. The daily practice of seclusion varies widely from family to family, depending in part on wealth and family background; yet, the Kano Hausa culture is also strongly entrepreneurial, and there is good evidence that many women in seclusion operate successful businesses.[1]

High levels of occupational segregation exist in Kano, including in the cowpea value chain. In farming, age and gender are important determinants of appropriate activities. Marketing is dominated by men, most likely because of their relative freedom of mobility. Processing—currently an informal, household activity—is dominated by women, although industrial processing could change these trends. Vending of processed cowpea products is usually done by the processor/preparer or other family labor.

In Kano, there is little large-scale (industrial) processing of cowpeas, either as flour for further preparation in final products. Although extensive research and related literature exists on the potential for processing cowpeas, businesses have not made use of the information. Thus, to expand the processing of cowpeas, one must explore the reasons for limited uptake of the knowledge and technology. This study demonstrates the potential for advancing the commercialization of cowpea flour processing in the Kano area, and the role that the MARKETS Project can play in ensuring that these technological and business advances engage the poorer segments of the population and improve, rather than exacerbate, gender inequalities.

KEY RECOMMENDATIONS

The primary objective of interventions should be to assist those with poor returns to improve or expand their business activities. Central components should be increasing education and skills, fostering organizational innovation, and adopting appropriate technology. The following recommendations identify areas of intervention with the potential to reduce gender inequalities and increase returns to the poorest, many of whom are women. Because strong cultural and religious practices influence the occupational segregation and division of labor among men and women, it is important to explore a wide range of options.

REDUCING BARRIERS TO INCREASED RETURNS ON PRODUCTION

- Farmer education and training. As farming in the Kano area develops, smallholder farmers, both men and women, will only survive if they have the skills to compete, as well as farm management expertise through extension services. The evidence indicates that Kano women are owning and managing more farmland than in the past; and, in turn, this indicates that the acceptance of women's rights to inherit land and houses under current Islamic law is increasing. An in-depth analysis of gender roles in farming systems is necessary to determine how interventions, such as farmer education and training, could account for a shift in roles and increase benefits to women and men. In addition, given the importance of cowpeas in household consumption, the analysis should explore the impact of the shift in roles on household food security and decisions concerning the production and marketing of cowpeas.

- On-farm cowpea storage. Improved on-farm storage increases returns to production through greater revenues. As women are heavily involved in post-harvesting activities such as threshing, storage messages might be more effectively targeted if women are included in the process. Female extension agents could be useful in helping to reach an increased number of women in some areas.

EXPANDING COWPEA PROCESSING

- Several firms in Kano are interested in milling cowpeas but have not been successful to date. One principal constraint for these firms is the length of time it takes to obtain certification required by the government. An analysis of the standards and certification process to create a more conducive business environment might facilitate the development of these firms.

- If industrialization does occur in cowpea milling or processing, it is important to consider the constraints to women's participation in the public arena. Women have moved into industrial processing in many countries, with accommodation for different cultural norms and practices. A gender analysis may help identify and design interventions that improve women's participation in industrial cowpea processing.

INCREASING RETURNS TO INFORMAL COWPEA PROCESSORS AND VENDORS

- Cowpea street food vendors need to acquire more sophisticated business skills. The expansion of their product line to include other foods is one possibility. Better production and sales facilities (e.g., a bench, shed, or building) might help. Vertical linkages with cowpea processing (informal or industrial processing) through the provision of readily available and acceptable cowpea flour would reduce labor requirements.

- Informal cowpea processors could benefit from networking organizations for training in production and marketing techniques. In India, organizations of street vendors and self-employed women have been successful in expanding business, surmounting credit barriers, and negotiating with the government (see www.wiego.org).

- The industrial processing of cowpea flour has potential to benefit informal cowpea processors and vendors through the varied use of cowpea flour and the potential nutritional impact of the increased consumption of protein-rich products by consumers. The MARKETS Project should continue to support the development of the processing sector.
- The MARKETS Project's focus on industrial processing could marginalize informal cowpea processors; industrially processed cowpea products could actually reduce the informal sector's customers. The major barrier to assisting informal processors is that they are spatially dispersed and do not have a professional association. Almost all the informal processors are women, and many of them practice seclusion. One way for the MARKETS Project to target and communicate with women, particularly poor women, might be to develop a cooperative approach for groups of informal processors to use cowpea flour and buy inputs.
- Identifying some specific cowpea characteristics desired by processors and consumers could increase profits for farmers and ultimately the processors as well. These characteristics might include ease of removal of the *hilum* and *testa*, increase of flour yield, improvement in taste, and reduced cooking time (an important characteristic for women who are involved in food preparation).

As the Nigerian economy develops, formalization of the cowpea value chain can be expected. Smallholder farms might be consolidated—a global trend in agricultural sectors. Mechanical grain handling facilities will likely deal with greater volume and be managed by marketing organizations. Street food vending, with demands for food safety and consistency, will likely transform into a fast food sector, based on the model in Europe and North America. This formalization process will probably take many years.

Overall, increasing women's returns in the cowpea subsector in Kano State, Nigeria, depends on identifying interventions that are culturally and religiously acceptable. Economic and demographic pressures might change the gender segregation of economic activities and increase women's returns; or innovative means, such as advanced technology, might increase their returns without a change in gender segregation. For international development organizations, the question is whether to help women innovate within the cultural and religious limits that they set for themselves, encourage them to modify those limits, or be observers.

INTRODUCTION

The cowpea is one of the most economically and nutritionally important indigenous African grain legumes produced throughout the tropical and subtropical areas of the world. Cowpeas play a key role in the agriculture and food supply of Nigeria: Nigeria is the largest producer and consumer of cowpeas, accounting for about 45 percent of the world's cowpea production. As of 2004, it was also the world's largest cowpea importer. Kano State is in the heart of the Nigerian "cowpea belt," and cowpeas are grown on almost every farm in Kano State and are eaten in some form by almost every Kano consumer.

From February – June, 2007, under the Greater Access to Trade Expansion (GATE) Project, a Cowpea Subsector Study was conducted to assess the cowpea value chain and provide recommendations on how to enhance the strategy of the Maximizing Agricultural Revenue and Key Enterprises in Targeted Sites (MARKETS) Project by incorporating a pro-poor approach to mitigate the exclusion of or negative impacts felt by the poor, especially poor women. Funded by USAID/Nigeria, the MARKETS Project aims to expand economic opportunities in the agriculture sector by increasing sales and jobs for agricultural-related businesses throughout Nigeria.[2]

METHODOLOGY

The objective of this study was to analyze the cowpea value chain in Kano State, Nigeria, to identify strategies to benefit the poor, particularly poor women.[3] The study team conducted (1) an extensive literature review on cowpeas for Nigeria and the West Africa region and (2) interviews with a range of actors in the Kano cowpea value chain. Qualitative and quantitative methods of analysis were applied to understand the role and participation of women and other disadvantaged groups in the value chain.

The study team's field work focused on the following objectives:

1. Describe the cowpea subsector of Kano State, with particular attention to the role of women, the poor, and disadvantaged minorities
2. Identify cowpea subsector business growth opportunities that can involve women, the poor, and disadvantaged minorities
3. Recommend strategies for MARKETS to promote opportunities for women, the poor, and disadvantaged minorities

MARKETS COWPEA STRATEGY

The specific objective of the MARKETS project is to expand economic opportunities linked to agriculture by increasing productivity, enhancing value-added processing, and increasing commercialization.[4] MARKETS has identified the limited use of advanced technology for cowpea production and limited industrial processing as two key challenges in the cowpea value chain in Nigeria.[5] Other identified challenges include the following:

- Limited use of improved varieties
- Poor access to farm inputs
- Limited characterization of consumer preferences

- Poor linkages to markets

The MARKETS strategy to improve cowpea production and use is based on four approaches:

- Spreading high-yielding varieties that are resistant to pests and diseases and that have a high protein content and high flour yield-to-grain ratio
- Training farmers on the use of new technologies to increase productivity
- Improving the processing of cowpeas to improve the products' ease of use and shelf-life and to offer consumers variety
- Facilitating linkages of processed/value-added products to target markets

MARKETS' activities to date include contracting agricultural development programs and extension officers to train farmers on input use; working with farmer groups to encourage use of improved seed, pesticides, and fertilizer; linking cowpea producers to processors; and brokering deals between processors and end-users.[6]

The expected results for the project over its lifetime include the following:

- Over 2,500 farmers networked
- Increased yields from about 900 kg/ha to 1,500 kg/ha
- Increased processing of cowpeas
- Networked cowpea processors, equipment fabricators, and market outlets
- Guaranteed markets identified for cowpea processors
- Arrangements made between cowpea processors and Nigerian fast food chains

STRUCTURE OF THE REPORT

This report describes the cowpea value chain in Kano State; draws on extensive literature on cowpea production, research, marketing, and processing in West and Central Africa; and details production, marketing, and consumption levels and linkages.

All the economic actors in the value chain are depicted, including their gender roles and economic status. The historical and cultural context of Kano State is first outlined because of its relevance to their gender roles and economic status.

The report also presents the results of a quantitative analysis of business decision making by Kano cowpea processors/vendors based on primary data collected for the study. The report's conclusion highlights recommendations for the MARKETS Project.

THE HISTORICAL AND CULTURAL CONTEXT OF KANO STATE

KANO STATE—POPULATION AND ETHNICITY

Kano was one of the original seven Hausa kingdoms in what is now northern Nigeria. Kano City was founded around the 6th Century A.D. Islam was introduced to Kano in the 14th Century[7][8]. Kano State is largely inhabited by the Hausa (an ethnic group). Two other population groups are of note: the Fulani (a smaller ethnic group) and recent immigrants from southern Nigeria. The Fulani are noteworthy for their traditional leadership (e.g., the Emir of Kano is of Fulani origin) and nomadic livestock herding. Though livestock herders often lack formal education, they often have more assets than their neighbors because of livestock ownership. Immigrants from southern Nigeria are concentrated in the areas around Kano City (e.g., Sabon Gari) and are often better educated than their Hausa neighbors. The study focused on the Hausa because of the group's size and poverty levels.

According to the 2006 Census of Nigeria, with about 9 million people, Kano State is the most populous of the 36 Nigerian states.[9] Almost 25 percent of the population lives in Kano City.[10] Almost 40 percent of the population lives in the central zone of Kano, comprising the city and surrounding area.[11]

WOMEN IN KANO STATE AND "SECLUSION"

The interpretation of Islamic law as it relates to the role of women in Kano society has been contentious. The practice of *purdah*, or the seclusion of women, was introduced at the time of Usman dan Fodio's Jihad in the 19th century and is widely practiced in Kano State.[12] Seclusion means that many Muslim women who are married and of childbearing age are restricted to their home compound with occasional visits to family.[13] The practice of seclusion is important to consider because of its potential impact on the economic activities of women.

The daily practice of seclusion varies widely from family to family, depending in part on wealth and family background.[14] Cultural values and customs as well as family structure and socio-economic status change over time. Some newly rich families keep women strictly secluded, in part as a sign of their family's new found wealth. Many poor and rural women aspire to seclusion as a step up the social ladder. In families where husbands are involved in business, academic, or government occupations, wives and daughters often receive western education and work in office jobs. The degree to which Islamic law requires seclusion has been debated. Some argue that seclusion, as it is practiced in Kano, is strongly influenced by Hausa cultural values.

Yet, Kano Hausa culture is also strongly entrepreneurial; and there is good evidence that many women in seclusion operate successful businesses.[15] Women from most socio-economic classes are involved in economic activities. Wealthier women may run businesses, such as an international import-export business, even traveling abroad to Middle Eastern countries.[16] Although few women are found in the industrial sector, the accommodation of seclusion practices, such as separate rooms for male and female

workers, might draw more women into this sector. In rural areas, as suggested above, the need for women's labor in agriculture and other activities results in a looser practice of the custom. The poorer the family, the greater need for women to maximize their earnings, resulting in more mobility and social interaction with those outside the accepted family network.

THE COWPEA VALUE CHAIN IN KANO STATE

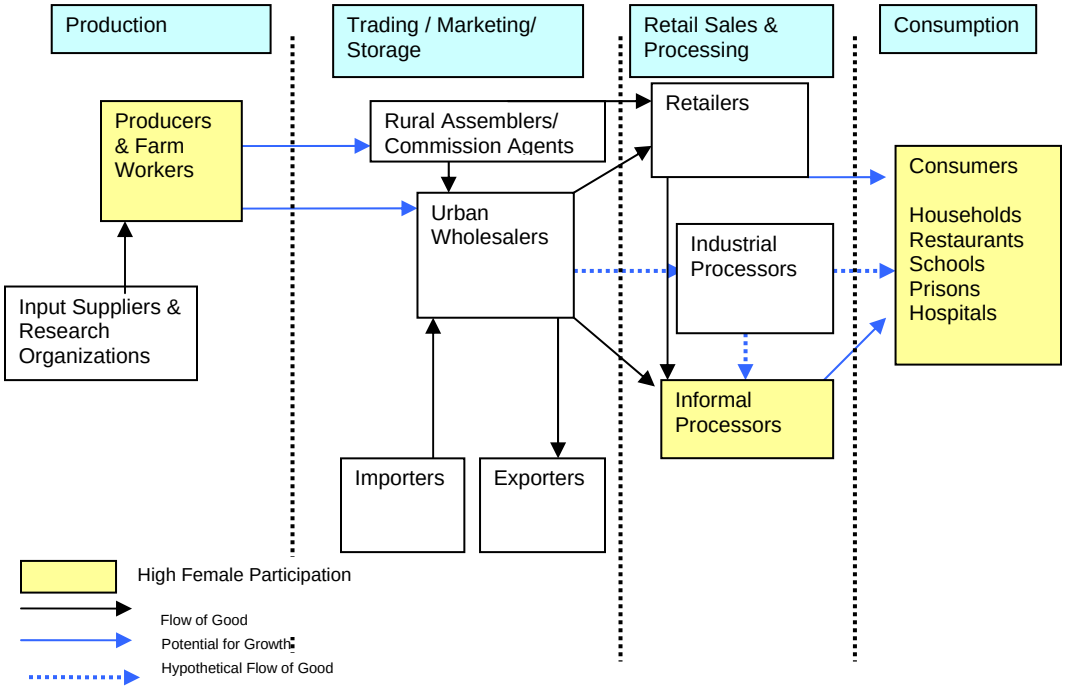
A value-chain analysis identifies the institutional arrangements that link producers, processors, marketers, distributors, and consumers; and recognizes the power differentials, as well as the distribution of value among these actors. Value-chain analysis has become an important tool with the globalization of trade. This section briefly describes the various actors in the cowpea value chain. The following sections focus in greater detail on each level in the chain.

The cowpea value chain in Kano State is similar to that throughout most of West and Central Africa.[17] Figure 1 illustrates different links in the cowpea value chain. The key economic actors in the cowpea value chain include the following:

- **Agricultural research organizations**—Work on genetic improvement, pest management, and storage technology development. Major institutions include the government, the International Center for Tropical Agriculture (IITA), and other research organizations.
- **Input supply businesses**—Provide fertilizer, pesticides, and other inputs to growers.
- **Producers**—Work largely on small farms. Farmers control land and manage the production process, including soil preparation, planting, weeding, harvesting, threshing, and storage. Producers might or might not do the physical work of cowpea production.
- **Farm workers, including family labor**—Do the physical work of cowpea production.
- **Grain merchants (rural assemblers and wholesale)**—Sell either in small quantities to rural assemblers and commission agents, who assemble 100 kg bags which are resold to urban wholesalers or sell whole bags directly to urban wholesalers. Wholesalers might also have a rural labor force purchasing in remote villages. In Kano, urban wholesalers augment the local cowpea supply with imports. Grain merchants store and resell to wholesalers, retailers, or public consumers. Merchants operate their own transport or hire transport.
- **Grain retailers**—Buy grain from farmers or merchants and resell it to consumers, generally in open-air traditional markets. Almost all cowpeas are sold as bulk grains.
- **Processors, Industrial and Informal**—Buy cowpea grain and convert it into an intermediate or consumer product. For instance, a processor might mill cowpeas into flour and sell the flour to street vendors and consumers. The industrial processing of cowpeas is in the pilot phase, and the quantity of cowpeas currently processed is negligible. Informal sector cowpea processors, almost exclusively women, are much more numerous.

- **Commercial food preparation businesses**—Include formal sector restaurants as well as informal businesses such as street vendors.
- **Consumers**—Purchase and consume cowpea-based foods in restaurants and on the street, as well as prepare them at home from raw ingredients.

Figure 1. Cowpea Value Chain in West Africa



Source: Modified from Musa, Sehu. *Marketing of Cowpea in Nigeria: Econometric Studies of Quality Factors and Market Integration*. Ph. D. Dissertation. Bauchi, Nigeria: Department of Agricultural Economics and Extension, Abubakar Tafawa Balewa University, 2003. and Ibro, G., Ramatou Seydou, Kaka Saley, Kira Everhart-Valentin, Joan Fulton, J. Lowenberg-DeBoer, and Miriam Otoo. Testing the Market Potential for a New Value-Added Cowpea Product to Improve the Well-Being of Women Entrepreneurs in West Africa. Paper presented at the Association for International Agricultural and Extension Education Annual Conference, EARTH University, Costa Rica, March 10–15, 2008.

The following sections describe the actors in greater detail (including their gender roles and participation criteria and constraints) and also present the value chain within the context of cowpea production, trade, and consumption in Nigeria and West Africa.

COWPEA PRODUCTION AND PRODUCERS

The cowpea is the most economically and nutritionally important indigenous African grain legume. Cowpeas (*Vigna unguiculata*) are produced throughout the tropical and subtropical areas of the world; thus, there has been considerable research on the crop and its uses.[18] Most of the research on cowpeas has been conducted in Nigeria by the IITA and agencies in the United States and Brazil. The United States is the only industrialized country with substantial cowpea production, and it dominates world trade in premium-quality cowpeas. Exported U.S. cowpeas are almost always blackeye peas

and are recognized by their large grain size, bright white *testa* (seed coat), and dark black eye. Occasionally, U.S. cowpeas make their way to shops in Nigeria, but they represent only a tiny fraction of consumption.

COWPEA VARIETIES

The genetic improvement of cowpeas has significantly increased resistance to plant diseases, insects, and drought.[19] Improved varieties are used in some parts of West Africa (see Box 1 for information on the main selected varieties).

Box 1. Cultivation of Improved Varieties of Cowpeas in West Africa

Moussa indicates that almost 70 percent of a random sample of farmers in Niger reported using improved varieties; and almost 50 percent of farmers in Burkina Faso, Nigeria, and Cameroon reported using improved varieties.[20] A few studies have estimated the area sown with improved cowpea varieties and the resulting economic impact. Diaz-Hermelo and others estimate that the BR1 and BR2 varieties constitute about 13 percent of the cowpea area in the north and far north provinces of Cameroon, mainly in monocrop cowpea fields.[21] They also estimate that the purified local variety, Vya, constitutes about 10 percent of the cowpea area, mainly in intercrop situations. Boys reports that the varieties *Melakh* and *Mouride* constitute under 4 percent of the cowpea area in northern Senegal.[22] Because *Melakh* is preferred for the production of green cowpeas (i.e., southern peas), the internal rate of return on the Collaborative Research Support Program/ Senegalese Institute for Agriculture Research (CRSP/ISRA) breeding program was quite high in spite of the relatively small area sown. The estimated rate of return was about 13 percent annually.

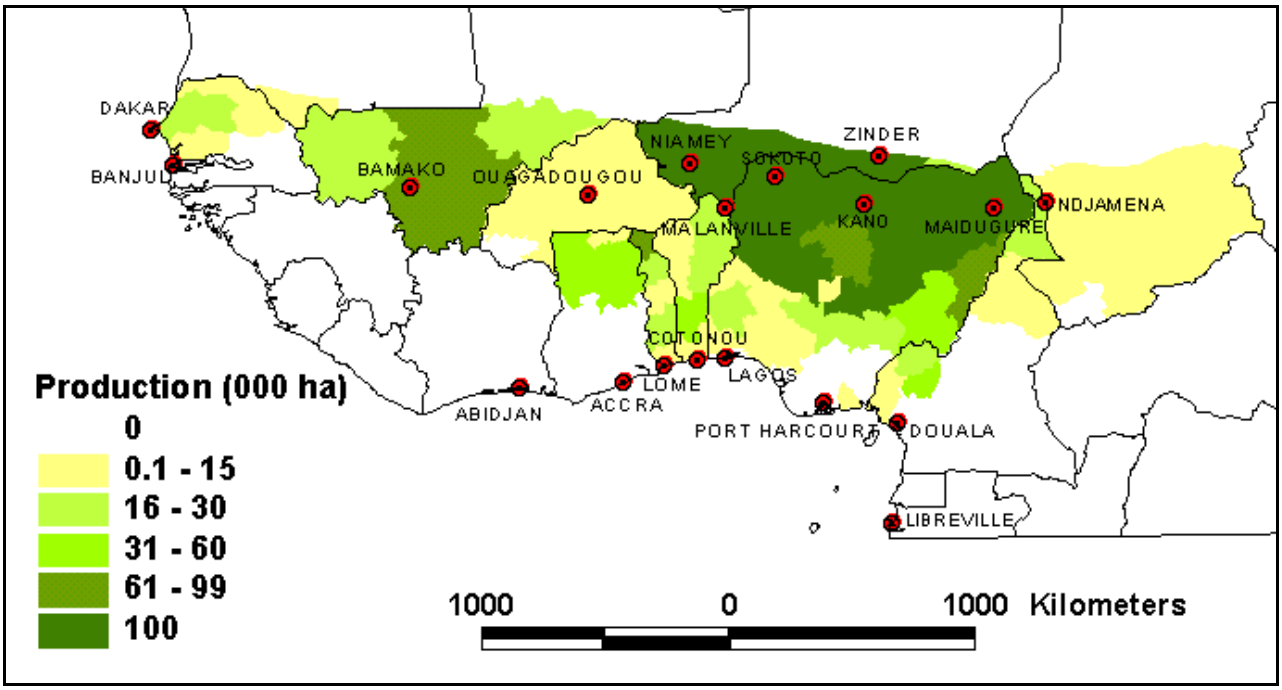
Hypotheses about the relatively low area sown for improved cowpea varieties center on the lack of a developed seed system in West and Central Africa and the size of yield gains relative to the cost in obtaining the seed. The development of a seed system for cowpeas is hampered by the difficulty in building a sustainable business model for varietal seed—from which farmers can save their own seed for subsequent years. Worldwide, most profitable seed systems are centered on hybrid seed, which farmers must purchase every year.

COWPEA PRODUCTION IN THE NIGERIA COWPEA GRAINSHED

Cowpeas play a key role in the agriculture and food supply of Nigeria. The major consumption center for cowpeas is the densely populated area of southern Nigeria. The grainshed[23] includes all the countries bordering Nigeria, as well as Togo, Ghana, and Mali.[24] In some cases, cowpeas may be shipped to Nigeria from as far away as Senegal and Sudan.

Nigeria is the largest producer and consumer of cowpeas in the world.[25] In the 1990s, Nigeria accounted for about 45 percent of the world's cowpea production. As of 2004, it was also the world's largest cowpea importer, with annual imports of around 300,000 metric tons from neighboring countries. Niger was the largest single source of cowpeas imported to Nigeria in the 1990s, with around 260,000 metric tons per year. In Nigeria, most cowpea production is in the northern part of the country (see Figure 2).

Figure 2. Principal Cowpea Production Areas in West Africa



Source: Lagnyintuo et al. Cowpea Supply and Demand in West Africa. Field Crops Research 82 (2003): 215–231.

Official statistics indicate that cowpea grain production in Nigeria has increased substantially in last five years (see Table 1). Annual production has more than doubled from the 1,300,000–1,400,000 metric tons reported in the early 1990s[26] to 2,815,000 metric tons in 2005. Most of this increase is due to an expansion in the cowpea area, as yields have increased only modestly.

Table 1. Cowpea Production, Yield and Area in Nigeria, 2000–2005

Year	Production	Area	Yield
	(000 mt)	(000 ha)	(kg/ha)
2000	2,150	3,583	600
2001	2,172	3,620	600
2002	2,311	3,669	630
2003	2,459	3,726	660
2004	2,631	3,987	660
2005	2,815	4,141	678

Source: Food and Agriculture Organization, "Core Production Data," http://faostat.fao.org/ (accessed June 25, 2007)

COWPEA PRODUCERS

The Kano Closed Settlement

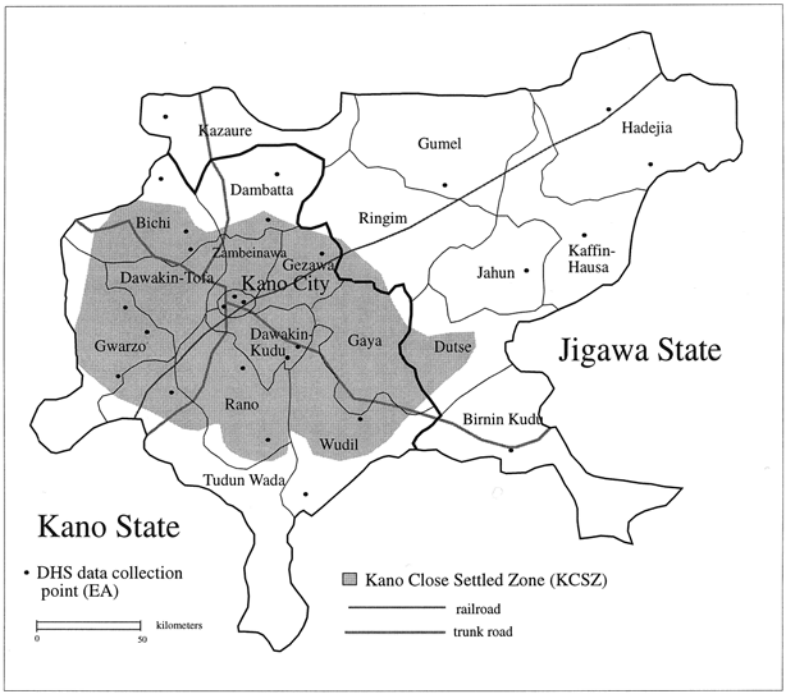
Kano State is in the heart of the Nigerian "cowpea belt." Cowpeas are grown on almost every farm in Kano State and are eaten in some form by almost every Kano consumer. In the mid-1990s, the state produced almost 200,000 metric tons of cowpea grain annually,[27] approximately 7–8 percent of reported national production. More recent

unpublished data suggests that the current levels are lower, averaging closer to 75,000 metric tons from 2004 to 2006.[28]

Extensive agricultural research has been done in Kano State because it has one of the few examples of successful long-term continuous crop cultivation in sub-Saharan Africa. In particular, the Kano Closed Settle Zone (KCSZ) has been the subject of many studies.[29] The continued productivity of Kano State farms has surprised researchers. The soils are sandy, low in organic matter and not inherently fertile, and rainfall is erratic.[30] Almost all of the Kano State countryside is cultivated. There is little grazing land and almost no fallow. Adams and Mortimore indicate that between 1961 and 1991, the percentage of land cultivated remained almost constant at about 87 percent, but land per capita fell from 0.36–0.29 ha.[31] The long-term success of the farming system has been linked to the careful management of organic materials, including livestock manure and urban organic wastes from Kano City, and to the use of nitrogen-fixing leguminous crops, such as cowpea.

Cowpea is a key crop in the traditional farming systems of the Kano area.[32] Other crops grown during the rainy season include sorghum, millet, groundnuts, maize, cassava, rice, and vegetables. In the dry season, farmers with irrigation produce vegetables, wheat, and maize. Cowpea grain is a cash crop and also consumed by the farm families. Cowpea leaves and stems are valued as fodder for livestock. Nitrogen fixation by cowpea production and manure—generated by livestock fed with cowpea residue—has been identified as central to maintaining soil fertility in the KCSZ (see Figure 3).

Figure 3. Map of Kano and Jigawa States Showing the KCSZ and Local Government Areas (1990s)



Source: Rain, David. "The Women of Kano: Internalized Stress and the Conditions of Reproduction, Northern Nigeria." *GeoJournal* 43 (1997): 175–187.

Almost all Kano State farmers produce cowpeas,[33] and cowpeas are an important source of income for farmers. Interviews for the study conducted in Madakanci and Lakawaya indicated that about 60 percent of cowpea grain is sold. In 2006, the value of cowpea sold (following harvest) averaged 8,700 *Naira* (US$69.60) in Mandakaci and 18,800 *Naira* (US$150.40) in Lakawaya. In Madakanci, cowpea revenue was about one third of the cashflow from rainfed crops and about 14 percent of the total sales of crop products.[34]

Almost all Kano State farms use manure to maintain soil fertility. In addition, most farmers use synthetic fertilizer, mostly on cereals.[35] Some use insecticides on cowpea. All the farmers interviewed in Madakanci and Lakawaya for this study use fertilizer, with an average application of 30 kg per hectare. In addition they used an average of 16 donkey loads of manure per hectare. More than 70 percent of the farmers interviewed in Madakanci and Lakawaya use field insecticides.[36]

Cowpea Producers: Gender Participation

Land, labor, and farm inputs are necessary for agricultural production; but access to them varies considerably among men and women and across households, cropping systems, and regions in Africa. Despite a growing awareness of the importance of understanding gender roles in agriculture, little in-depth research has been done. Due to the limited scope of this research, gender roles in Kano agricultural production were not fully explored, but some important issues were identified.

Access to land is often the most important criterion for agricultural production. Kano State farms are typically small and owned by large families with limited education (men and increasingly women have Koranic schooling). Traditional Hausa culture encourages sons to continue to farm with fathers after marriage and, subsequently, brothers to share farms under management of the eldest brother. Thus, farming units might be large, but cultivated land per worker is low. An average farm size of 4.1 ha and 12 household members was found in a survey of one Kano State village.[37] These results indicate that only 1.0 ha is cultivated per family laborer.

Land ownership and access in northern Nigeria are complex and changing. In Muslim households, women have had access to land (though not necessarily ownership) either through children or, at times, siblings. Divorced women might be granted back property that was brought into the household, including land. Researchers indicated that, in the past, Hausa women in the KCSZ did not inherit land, or if they did, there was strong social pressure on women to turn inherited fields over to male family members. Women's rights to inherit land and houses were taken away in 1923 but returned in 1954. Limited data and few studies exist on female land ownership in Kano, but some empirical evidence shows that women can control production on land within a household, rent labor for production, or rent out the land.

In a study in Kano and Kaduna, 20 percent of the farmers interviewed were female farmers, with the majority in the Kano area. The study states that most rural Muslim Hausa households "are non-corporate in most functions…the household is not a production or consumption unit and has no conjugal fund linking husband and wife as one financial unit."[38] The study also provides evidence of wives selling grain to

husbands who were the original providers of the grain, in cases when the husband does not have enough to make his own commitment to the spousal unit. The complexity of these intra-household relations requires that advances in cowpea production technology be examined to determine gender impacts.

According to the interview results for this study, in Madakanci and Lakawaya, in nine out of the 11 farm families, wives own fields. All but one of those wives inherited their land. The exception was a woman who held two fields as collateral for a loan; if the loan was repaid, she would return the land. Of the 17 wives for whom there are data, seven managed at least one field personally, hiring men to do the heavy field work, and nine rented out the fields. A common rental agreement allocates one-third of the harvest to the owner. Most women managed only one field personally, and any additional land was rented out. One woman gave her field to her husband to farm, and one woman turned her fields over to her brothers. The Madakanci and Lakawaya data suggests that the inheritance rights of women under Islamic law are increasingly being respected.

Access to and control over labor are also important determinants of participation in farming. Gender roles in farming in the Kano area have changed over time; prior to the introduction of seclusion, evidence suggests that Hausa women were actively involved in all aspects of crop production. The role of women in field work changed with the introduction of Islam and, in particular, with the Jihad of Usman dan Fodio in the early 19th Century.[39] The seclusion of women is most strictly interpreted in the city of Kano and the Kano Close Settled Zone. Women are somewhat more involved in crop activities in the more rural areas and in the few remaining "Maguzawa" (Hausa animist) villages.

In general, married women of childbearing age do not undertake field work in Kano State; however, they are involved in many other aspects of production. Depending on how strongly seclusion is practiced within an area or a household, girls, unmarried women (e.g., widows, divorcees), and menopausal women might participate in field work, particularly in the less physically demanding activities such as planting or harvesting. Plowing and soil preparatory work is almost always considered men's work in African farming systems, especially when tractors and draft animals are used; but other activities such as weeding, harvesting, and post-harvest processing are frequently female activities. None of the women interviewed are involved in soil preparation or weeding, and most sources agree that these activities are rarely, if ever, performed by women in Kano farming systems.[40]

"Women farmers"—those who have access to or control over land—will frequently hire men to perform the field work. There are several women farmers groups in Kano State, including the Woman Farmers Advancement Network (WOFAN)[41] and the IITA women cowpea farmers' groups. In Kano State, about 800 women belong to IITA women farmers' groups—of which 363 manage farms.

An interview with a women farmers' group in Garko revealed the various roles women can play in cowpea farming. The women reported that they acquired their land mainly by inheritance, but may manage land belonging to their husband or children.[42] They may also rent or buy land. The Garko women hire men for field clearing, weeding, and

ridging; but they and their families are personally involved in planting, harvesting, threshing, and winnowing. Most of the women produced cowpea on monocropped plots; intercropping, if done at all, is with millet or sorghum. The women do not save seed, as they are confident they can obtain seed[43] from the IITA or the Agriculture Development Project (ADP). The cost of the seed is repaid with part of the harvest. They also obtain fertilizer and insecticide from the IITA at a reduced price on a cash-and-carry basis.[44] Most of these women reported using insecticides, usually spraying three times. The Local Government Administration (LGA) has sprayers, but they must still pay for each application. A typical field size is one hectare, which requires a minimum investment of 25,000 *Naira*. Average production is 30–35 bags per hectare, while a good year might be 40–45 bags.

These farmers also reported storing cowpeas on the farm. The women use triple bagging techniques learned from IITA technicians, with bags purchased in Kano costing 20–40 *Naira* each.[45] Given a yield of 30 bags, 20 bags would be sold as seed to the IITA or the ADP; two bags would be for family consumption or for processing as kosaï or other products; and the rest would be sold later to the IITA or the ADP. Few products from this group are sold in local or Kano markets.

The interviews with this farmers' group indicate that some women have secure access to land in parts of Kano State and some manage farms. A more representative survey of cowpea farmers delineating land ownership is needed to determine the gender division of land and labor resources in cowpea production. The MARKETS Project should consider these points as it promotes new varieties and technologies; attention should be paid to the effects of interventions relative to the shift in labor allocation among households.

ON-FARM STORAGE OF COWPEAS

Cowpeas are particularly susceptible to damage in storage, mainly by cowpea bruchids (*Callosobruchus maculatus*). Entomologists had hypothesized that African consumers were willing to tolerate up to one bruchid hole per grain before they demanded a discount. The data suggest that African consumers want a price discount from the first bruchid hole visible in a sample of grain. Estimated discounts in Senegal, Cameroon, and Ghana ranged from 0.17 to 2.3 percent of the average annual cowpea price per hole.

Insecticides are widely used, and misused, to control storage insects, as evidenced by Nigerian press reports on poison cases.[46] Sudden deaths, blindness, and skin irritation are among the problems attributed to use of inappropriate storage chemicals in Nigeria.[47] The Bean/Cowpea CRSP, along with partners in Senegal and Cameroon, have developed a portfolio of non-chemical storage methods that have been well received by farmers in West and Central Africa. Region-wide, about 30 percent of all cowpeas are stored using the CRSP's hermetic techniques, and the regional annual internal rate of return on this research is estimated to be 27 percent.[48, 49]

According to interviews in Madakanci and Lakawaya, all farmers storing cowpeas used storage insecticides. Moussa indicates that for northern Nigeria, about 95 percent of stored cowpea is treated with insecticide.[50] Farmers use insecticides even when they are using storage methods that do not require their use.[51] While many farmers are

worried about the health effects of insecticide use, Bokar reports that they either do not have access to cost-effective hermetic containers (e.g., heavy duty plastic bags), or they do not understand hermetic techniques.

Women appear to be managing resources internal to compounds and might therefore be instrumental in managing cowpea storage, including levels and food storage methods. Directing safe storage messages to women in farm households might be an effective means of increasing compliance and safety.

TRADERS AND WHOLESALERS: MARKETING AND PRICES

TRADE

In West and Central Africa, the cowpea trade is an ancient practice that pre-dates European intrusions into that region.[52] Musa reports that cowpea marketing in Nigeria, and in Kano in particular, is highly competitive.[53] The center of this cowpea trade is Dawanau Market in Kano. Merchants in Dawanau Market support a well-developed collection system throughout northern Nigeria and southern Niger. These merchants provide credit to buyers in local markets, who buy small quantities of cowpea (often in 10 to 20 kg lots) until they accumulate 100 kg bags, which are stored until a truck transports them to Kano. Dawanau merchants are seen as having monopsony power, determining cowpea prices in the Nigeria grainshed. However, Musa analyzed multi-year price data from several Nigerian cowpea markets and concluded that, while the prices are highly correlated, there is no statistical evidence that Kano merchants have an undue influence. Musa notes that many other cowpea markets in northern Nigeria exist (e.g., Maiduguri, Dan Gombe, Sokoto), with direct trade links to consumption areas in southern Nigeria.

Merchants from the Dawanau Market cite transport costs and capital requirements as the major barriers to entry. According to Musa, about half of the merchants interviewed said it would be possible to start with 600,000 *Naira* (US$5,000) or less, suggesting that entry into the business was relatively easy. More than 70 percent of respondents obtained their start-up capital from personal savings, friends, and family. Only 12 percent obtained bank loans, and the rest borrowed from informal lenders. Musa states that the majority (78 percent) of cowpea merchants operate their businesses as sole proprietors.

Most merchants try to purchase cowpeas within the market area where they operate, but about 42 percent purchase directly from farmers with the help of sales agents. Prices are established by negotiation after physical inspection of the grain. Musa reports that in the Gombe market, about 45 percent of merchants handle more than 200 bags per year—one indication of volume.

MARKET STORAGE

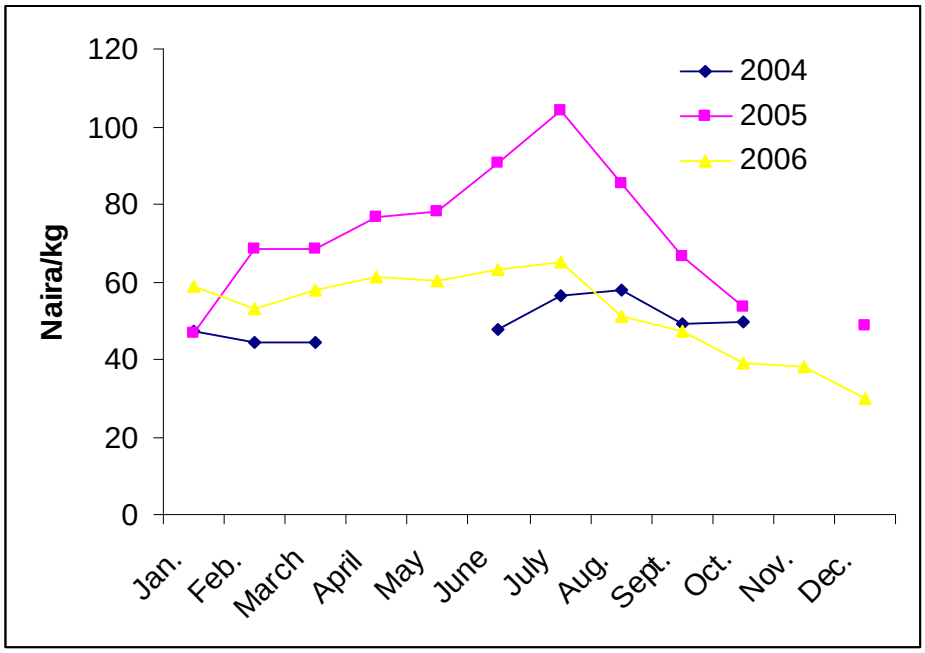
Cowpea storage is a big business in Kano. In the 1990s, the market had storage space for 200,000 metric tons of cowpea grain. Data from the Dawanu Market Association indicates that the market now has the capacity to store 900,000 tons of cowpea grain.[54] Musa indicates that most merchants who store cowpea grain for extended periods use storage chemicals.[55] However, they worry about the health effects of using storage

chemicals, and about 50 percent of merchants consider using storage chemicals to be hazardous.

PRICES

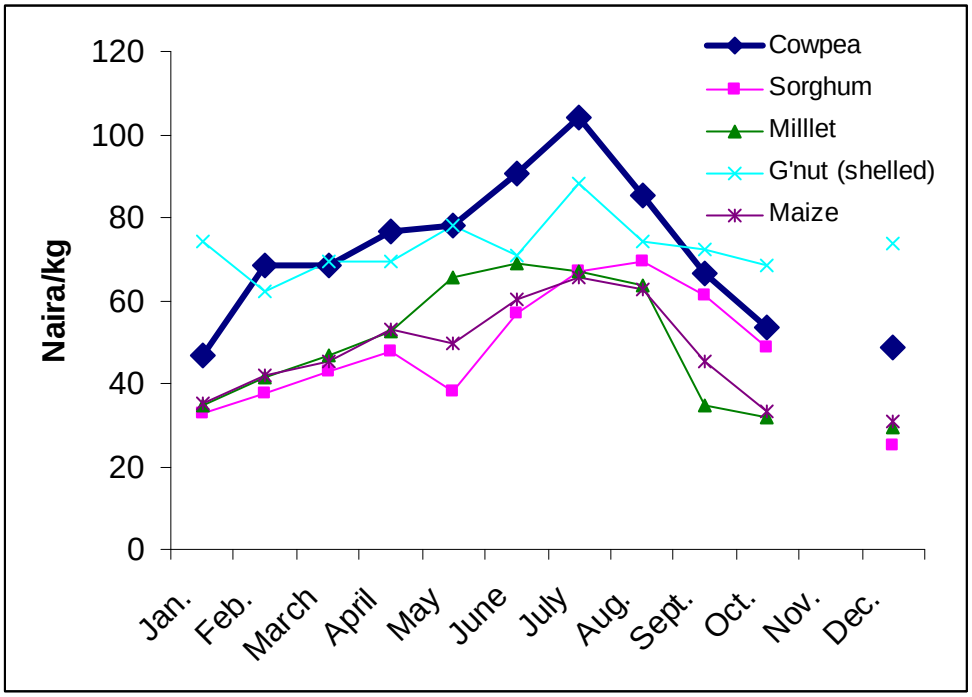
Cowpea prices in the Kano area show distinct seasonality, with the lowest prices typically occurring during the harvest period (October–December) and the highest prices occurring during the growing season (April–August). The amplitude of the price spread and date of peak price varies substantially from year to year (see Figure 4). Musa estimates that the month-to-month price variation during 1998–2001 was about 50 percent for December–June and almost 80 percent for December–August.[56] Cowpea prices in Kano are consistently higher than cereal prices and similar to prices of shelled groundnuts (see Figure 5). The ratio of cowpea to cereal prices is usually in the 1.5 to 2 range.

Figure 4. Kano State Retail Cowpea Prices (*Naira*/kg)



Source: Kano State Agricultural Development Program.

Figure 5. Kano State Retail Prices for Selected Grains (2005)



Source: Kano State Agricultural Development Program.

An important finding from the Kano cowpea price and quality studies is the consumer preference for larger cowpea grain size. At 18.4 grams per 100 grains,[57] Kano markets have almost the highest cowpea grain size in West Africa. Hedonic pricing analysis by Musa suggests that all other things equal, consumers will pay about 0.5 *Naira*/kg extra for an additional gram of hundred grain weight.[58]

GENDER ROLES IN GRAIN TRADE

Almost all grain traders in Kano are men. Few women in Kano State are involved in cowpea grain markets, although their role may be increasing. Musa interviewed 175 cowpea sales agents (intermediaries between producers and merchants) in Lagos, Kano, and Maiduguri—of which 97 percent were male.[59] Female sales agents were only found in Lagos in the south. He also interviewed 255 traders—of which 87 percent were male. Female traders were also only found in Lagos. Data from more recent surveys suggest the male dominance of cowpea marketing in Kano State continues. Data on trading collected in 2007 by Musa show only seven women in over 100 observations. The Dawanau Market Association roughly estimates the total number of traders in the market in the thousands. The number of women traders in the association has increased to 42 in recent years.

Although few women trade grain among the urban wholesalers, the presence of a few women in cowpea trading (e.g., the Dawanau Market) indicates that there may be room for more. Reducing barriers to entry, primarily capital costs, might encourage more women to start trading, particularly in local areas. Even if the transport and capital requirements do not pose significant barriers to the entry of women, many women in the

Kano area are restricted in their mobility due to cultural/religious practices and norms. Lack of mobility is probably the greatest barrier to entry into trading.

COWPEA PROCESSORS

COWPEA PRODUCTS

Cowpeas are consumed in several forms. The simplest form is "boiled cowpea," a dish whose name describes it fully. Cowpea grains are also milled (wet-milled, usually following soaking) into flour, which is then further processed by cooking. Other products include *moin-moin* (steamed cowpea paste) and *dan wake* (cowpea dumplings). *Moin-moin* and *dan wake* are prepared at home. A common street food, *kosaï*, cowpea flour mixed with spices and then fried, is eaten by many for lunches and snacks. See Box 2 for a more detailed description of these cowpea products.

Box 2. Cowpea Consumer Products

***Kosaï*—**a fritter traditionally made by wet-milling cowpeas, whipping the batter to incorporate air, and deep frying the batter. Onions, peppers, and various spices might be added to the batter. *Kosaï* are often eaten for breakfast or as a snack.

Dan Wake—a dumpling traditionally made by wet-milling cowpeas and mixing in dried baobab leaves to make a stiff batter. The batter is formed into balls and cooked in boiling water. Usually, dan wake is eaten as part of a meal.

***Kulu Wake*—**cowpeas boiled in water that is absorbed in cooking; only potash is added to the pot.

Moin-Moin—a "pudding" made by steaming a batter of wet-milled cowpeas. Usually, it is eaten as the protein component (i.e., meat substitute) of a meal, with a carbohydrate and a sauce or condiment.

INDUSTRIAL PROCESSING

Industrial processing of cowpeas in Nigeria, and in Kano in particular, has just begun and mainly under pilot activities. The study team interviewed four entrepreneurs (see Boxes 3 and 4 and Appendix B), which all have been contacted by the MARKETS Project. The processors interviewed had hammer mills (basic equipment) of varying capacities. Some entrepreneurs have developed and packaged sample products; but as of March, 2007, none had approval from the Nigeria National Agency for Food, Drug Administration, and Control for commercial sale. The sample products were either cowpea flour or manufactured from milled cowpea flour. No one interviewed in Kano was considering canned, frozen, or dry-pack cowpea products.

Processors identified the lack of a client base as the key constraint to increased industrial production. Convenience is not an issue for higher income households with sufficient help within the house with milling and cooking, so demand by this socio-economic group is limited. However, in Kano, even upper income consumers buy cowpea-based street food, particularly *kosaï*. Higher income consumers might be attracted by claims that packed cowpea flour is more hygienic than buying street food and by the image of buying an "elite" packaged product. Some of the industrial processors are planning to target street vendors as a potential market for cowpea flour; others see students as potential clients.

Box 3. Food Pro-Serve

The cowpea subsector team met with Abubakar Khalil, owner of Foodpro-Serve. Mr.Khalil said that he had a previous maize-milling business in Abuja, and MARKETS came to him with the idea of producing cowpea flour. He sees this product as a way to rebuild his business. Khalil has produced some sample packets of cowpea flour with equipment salvaged from his Abuja business. Individuals have started to come to his office wanting to buy cowpea flour, but he does not have NAFDAC approval, so he cannot yet produce commercially to sell to shops and supermarkets. He sells one kilogram of the *dan wake* mix for 120 Naira, and one kilogram of the *kosaï* and *moin-moin* flour for 100 Naira. He said that he thought the *kosaï* vendors might need larger size packages, particularly in southern Nigeria where a *kosaï* vendor might use 50 kg of cowpeas per day.

The target markets for cowpea flour, according to Khalil, are families with working mothers and men who live alone (for home preparation). He said that students are a potential market; and noted that one BUK student came and bought one packet, the next week he returned and bought 10, and the following week he bought 20. Khalil considered varietal differences to be important in cowpea flour processing. For example, rough seed coats will facilitate the de-hulling process. He expects cowpea flour processors to contract with farmers to obtain the preferred varieties, and these contracts would specify standards for the grain. He expects the flour to have a one-year shelf life if kept in a dry place at room temperature.

Mr. Khalil has a hammer mill with a 1.5 ton per hour capacity with a 0.5 mm screen and a plate mill for dehulling. The mills are powered by a one-cylinder diesel engine, which is less susceptible to electric power cuts. Obtaining NAFDAC approval requires extensive product testing.

Box 4. Dan Tata Foods

Dan Tata Foods is located in the industrial area of Kano. Yusef Maigari, General Manager, showed a locally manufactured hammer mill for cowpeas. If the product proves promising, they would move to imported processing equipment. He also had imported sesame cleaning equipment and some groundnut processing equipment. He added that the company was working with a food technologist, and they were considering adding baking powder and other additives.

Maigari said that their primary target market is street vendors of cowpea foods, then the home market, and, finally, the institutional market. Maigari was depending on the MARKETS Project to help with a market study. Maigari also said that Dan Tata Foods expected to contract with farmers for a consistent quality cowpea grain. The IITA-improved variety IT27-28 looked promising to him—both for flour yield and quality.

Maigari noted that the cost and reliability of electricity was the major constraint for them, as for all manufacturing in Kano.

Sex-disaggregated employment data are not available for Kano, but available evidence suggests that few women work in industrial jobs. All employees working in the cowpea pilot plants that were visited are male. There are barriers to women's increased employment in factories, such as cultural practices that restrict women from working with men. The current high unemployment among men, who may be given precedence in factory employment, is another factor working against the employment of women. However, globally, the gender division of labor in agricultural processing (as well as other industrial sectors, most notably textiles) has changed drastically over the years, with high numbers of women entering the labor market. Women participate actively in agricultural processing sectors in many countries in and outside Africa

(e.g., horticulture in Uganda and Kenya, poultry in Brazil and Thailand, and fish processing in India).[60]

One prospective female processor, a food technologist, was interviewed. With a focus on nutrition, she considered cowpea an important ingredient to meet Nigerian protein requirements. She is currently working with another processor but is reluctant to obtain a loan because she is a widow with children. Her presence indicates that although women are not active in cowpea processing as laborers, they might be able to start a processing business or work in management positions.

INFORMAL PROCESSING AND STREET FOOD VENDORS

The informal processors and street food vendors in Kano City are almost all women, as is the case throughout most of West Africa.[61] These women are also among some of the poorest in the city, especially those who rely on street vending for a large share of their income. A substantial amount of literature exists on informal food vendors in African cities. Hugon reviewed research on urban street food trade in several African countries.[62] Women food sellers in Abidjan, Côte d'Ivoire, identified several factors limiting their activities, including lack of access to capital, transport costs, storage, and lack of equipment. Pearce and others studied street food vendors in Ile-Ife, Nigeria, concluding that while the demand for street foods was quite stable, the profitability was low.[63] In addition to culture and tradition, Due and others highlight two primary constraints to improved economic status of women in Africa: lack of access to education and to capital.[64]

There are a large number of cowpea vendors—informal estimates in Bauchi, Nigeria, came to more than 500 vendors. The numbers in Kano are of far greater magnitude. For this study, interviews were conducted with 53 women involved in informal cowpea processing.

Cowpea-based products are prepared in houses or in streets or next to markets. The traditional process of milling is to pound wet de-hulled cowpeas in a mortar, but in urban areas, this process has been replaced by mechanically milling the wet, de-hulled cowpeas. Milling is usually done in plate mills, with engines powered by gasoline or diesel. Millers might be reluctant to mill cowpeas because they must disassemble and clean the mill before milling dry cereals. If vendors rely on mechanically-milled cowpea flour, then someone must go to the miller early in the morning to return the flour in time to cook and sell the products.

Dry-milled cowpea flour that yields a good-quality *kosaï* would decrease women's labor and reduce the insecurity entailed in an early morning trip to the miller. The dry-milled flour would also increase flexibility to accommodate day-to-day variability in demand. A recent study in Niger showed that hammer-milled flour had a 70 percent approval rating among street vendors—the flour saved considerable time and used less oil in cooking.[65]

Some women, particularly married women who generally do not sell outside the home due to seclusion, make the products at home; and customers come there to purchase them. What is not sold will be taken by young boys or girls to sell in front of schools or markets. The clients are diverse, ranging from children to the elderly, depending largely

on the vendor's location. For those selling at the bus stations, travelers, drivers, and mechanics are the main clients; for those selling in the neighborhoods, the clients are neighbors and school children.

On average, Kano vendors report that they process almost 6 kg of cowpeas per day, but some of the women surveyed are processing as much as 29 kg of cowpeas per day. The quantity of cowpeas varied as a result of the clientele. When farmers come to town, more products are sold. The 55 women interviewed processed a total of 303 kg of cowpeas per day. On average, there are 39 *maikosai*[66] in each ward surveyed in the Kano metropolitan area. With 13 LGAs in the Kano metropolitan area in central Kano State and an average of 10 wards per LGA, this suggests there are close to 5,000 *maikosaï* in the Kano area. Based on an average cowpea use of 6 kg per day, the *maikosaï* would use almost 26 metric tons of cowpeas per day in the Kano area.

The average net profitability for 47 vendors (with complete data) interviewed for this survey was 2,057 *Naira* per day, varying from an estimated loss of 775 *Naira* per day to a benefit of 15,632 *Naira* per day—compared with the Kano State minimum wage of 7,200 *Naira* per month or about 327 *Naira* per day. Recognizing that there might be some social pressure to underreport income in an interview, it appears that the vendors are earning considerably more than minimum wage levels.[67]

Vendors prepare six cowpea-based products in Kano. Women prepare one or more products at the same time. The most common cowpea products are *kosaï*, (25 percent of sales) and rice and cowpeas (25 percent of sales). The remainder of sales comprises *moin-moin* (19 percent); *dan wake* (13 percent); *kulu wake* (13 percent); and cowpea porridge, which may include yam (5 percent).[68] Cowpea-based products are sold throughout the day. Seventy-five percent of the respondents interviewed for this study operate only in the morning, while 17 percent operate only in the afternoon. A few (9%) who have more time and funds make *kosaï* both in the morning and afternoon.

The 53 vendors ranged from 19 to 70 years old, with an average age of 42 years.[69] Most of the cowpea food vendors interviewed are married women (63 percent), who use the income to buy food for their families and pay for school and medical fees. Thirteen percent of the respondents are widows, who have full financial responsibility for the family, and 12 percent are divorced. For many of these women, the sole income for the family comes from *kosaï*. Other vendors are young women from poor families, most of whom have children, who help supplement family income. In addition, some young women (under age 20) sell cowpea-processed products to pay for weddings. Unmarried young women are allowed to sell cowpea-processed products outside their homes and may work with married women in seclusion.

Ten percent of the cowpea vendors interviewed had no formal schooling; 22 percent had attended primary school. Eight percent had attended secondary school, and 60 percent had attended Arabic school. Analyzing trends, not just disaggregated by sex but also by age, might be necessary to understand education levels, as younger women might have greater access to both western and Koranic education.

Cowpea processing has long been an activity for Kano women. Entry and exit is common; however, for some women, it is a lifelong activity. The average duration for the vendors surveyed is 11 years, with the maximum being 40 years. There were some vendors in the survey who had only been in business for a month. Twenty-one percent obtained their capital from their families. Nine percent obtained loans from their husbands. A few poor vendors and orphans benefited from a gift of the *zakat*[70] house (2 percent). As shown in the following section, many women cite capital as a constraint in the expansion of their businesses.

Of those informal cowpea processors interviewed, 84 percent work every day and about 15 percent rest on Sundays. Taking Sundays off is common for those who sell on the streets in the Sabon Gari area, where there is a large Christian population and many workers, traders, and shopkeepers who do not work on Sunday. In Madakanci, one woman sells only five days per week. Family members provide most of the additional labor used in the production and sales of cowpea-based products by these cowpea vendors.

Women are the primary producers of cowpea-based products, and many sell their products, as well as engage younger and older women in these tasks. However, young men are also involved, and clearly male household members can be supportive in other roles. A more complete picture is needed to determine how these women source their cowpeas, where and how the cowpeas are ground into flour, and where the other ingredients are sourced. It would also be useful to know to what extent these women interact with others in the value chain, particularly men. An expanded examination of the potential markets for these products, including the institutional consumers discussed below, would also require a more detailed discussion of marketing strategies, such as transport.

COWPEA INSTITUTIONAL AND HOUSEHOLD CONSUMERS

CONSUMER PREFERENCES

Extensive studies have been done on cowpea grain preferences in West and Central Africa. Starting in 1997, Bean/Cowpea CRSP researchers collected cowpea price and quality data, showing that consumers, almost everywhere in West and Central Africa, want larger cowpea grain size.[71] Cowpea grain size varies widely within and among the studied markets, but it is well below the grain size of the premium U.S. cowpeas (minimum grain size 25 grams per hundred grains). Average grain size across markets in West and Central Africa varies from 12 to 20 grams per hundred grains.

Consumers are also sensitive to insect damage. Studies suggest that African consumers want a price discount from the first bruchid hole visible in a sample of grain. Estimated discounts in Senegal, Cameroon, and Ghana ranged from 0.17–2.3 percent of average annual cowpea price per bruchid hole. Preferences for other visual cowpea characteristics were more localized. Preferences for *testa* color and texture and *hilum* color depend heavily on the type of foods prepared. In those areas where cowpeas are de-hulled to make various fried foods (e.g., *kosaï*, *moin-moin*, *dan wake*), there is a premium for rough-textured cowpeas that are more easily de-hulled. Color is most important where cowpeas are cooked whole. For instance, in some areas where rice

and cowpeas ("rice and beans" is the pidgin term) are a regular part of the diet, consumers prefer red cowpeas because the red color contrasts with the white rice.

Data on preferences for biochemical characteristics such as sucrose content, protein content, and cooking time comes mainly from studies conducted in Senegal and Niger.[72] These studies suggest that consumers are willing to pay for sweeter-tasting cowpeas, higher protein, and shorter cooking time. The hypothesis is that consumers in Niger have a preference for higher protein cowpeas, because higher protein levels increase foaming when making batter resulting in a lighter textured fritter (e.g., *kosaï*). It is interesting to note that industrial processors also prefer high-protein cowpeas;[73] but the protein is desired in order to substitute cowpeas for soybeans in certain processed foods. Informal processors would benefit from a shorter cooking time. Further study of the characteristics that informal cowpea processors might desire could be useful.

Bakori reports that Nigerian consumers prefer small-sized, lighter-colored *kosaï*.[74] Statistical results for Bakori's time series data from Bauchi are similar to those in the cross-section data set but showed that consumers discount the price of brownish refried *kosaï*. Most consumers prefer *kosaï* hot out of the oil. Fresh, newly fried *kosaï* should be a reddish color. Some vendors put unsold *kosaï* back in the oil to reheat them, and the refried *kosaï* turns browner. The color of the *kosaï* is also related to the spices added; too many spices (particularly pepper) will turn the *kosaï* a brownish color. Some preliminary data from Niamey, Niger, shows that women making *kosaï* with dry-milled cowpeas experience a price discount.[75]

TOTAL HOUSEHOLD CONSUMPTION ESTIMATES

Table 2 summarizes available data on cowpea grain use in Kano State. Based on estimates of consumption and use, the bulk of cowpeas are prepared and consumed at home. Street foods, based on the calculation in the previous section, account for only 3.3 percent of consumption. Comparing total consumption to production[76] suggests that Kano State is a net cowpea importer, especially when considering that large quantities of cowpea pass through Dawanau Market on their way to southern Nigeria.

Table 2. Estimated Cowpea Consumption in Kano State, 2007

Use	Mt/year	Percentage
Street Foods 1/	9,490	3.3%
Home consumption 2/	234,217	80.9%
Prisons 3/	229	0.1%
Schools	543	0.2%
Hospitals 4/	500	0.2%
Seed 5/	15,788	5.5%
Other, including storage loss 6/	28,916	10.0%
Total	**289,682**	**100%**

1/ Assumes 26 tons consumed per day.
2/ Assumes an average household size of 12 to 13 people, consuming an average of 6 kg/week.
3/ See section D.4 below for estimated consumption.
4/ It is assumed that hospitals use about as much as schools.
5/ Seed use assumes that 90 percent of 1,754,200 ha of arable land in the state is intercropped with cowpeas at a seeding rate of 10 kg/ha.
6/ Assumed at 10 percent.

HOUSEHOLD CONSUMERS

Most consumers in Kano State buy cowpea grain in traditional markets or small shops for home preparation. Data from "person-on-the-street" interviews in Kano indicate that 77 percent of those interviewed purchased cowpea grain in traditional markets, 15 percent purchased it in shops, and 8 percent consumed cowpea grain from their own farms. The average purchase for these households (with an average household size of 13) was 6 kg/week/family.

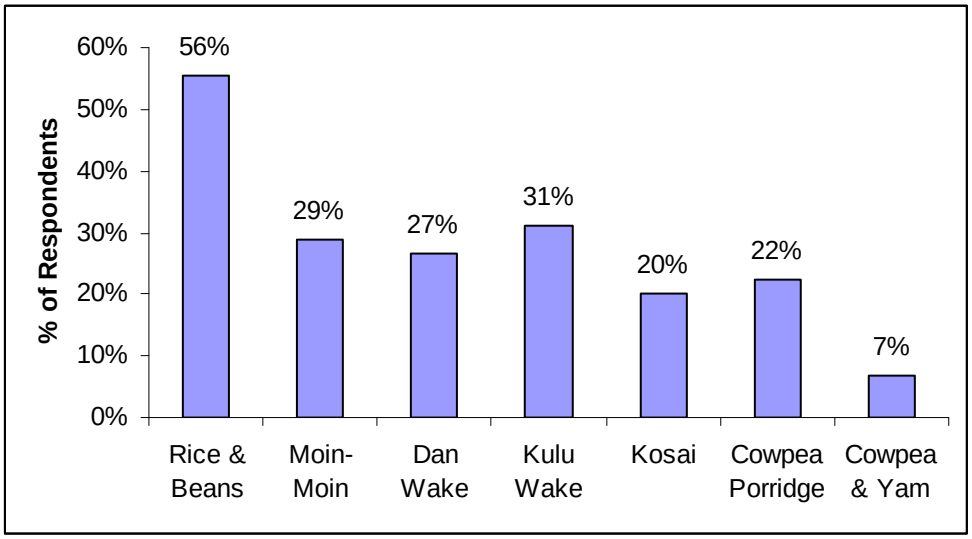
When asked how many times per week these consumers eat cowpea foods, the modal answer is four times per week. The most common cowpea dish prepared at home is "rice and beans," which is prepared by 56 percent of the respondents (see Figure 5). *Kulu wake* (cowpea boiled in water that will be absorbed in cooking—only potash is added to *kulu wake*), *moin-moin* (steamed cowpea paste) and *dan wake* (cowpea dumplings) are all prepared by about 30 percent of respondents. *Kosaï* is prepared at home, at least occasionally, by about 20 percent of respondents.

In contrast to the low consumption of industrial cowpea products, many Kano residents buy cowpea-based street foods. A "person-on-the street" survey found that more than 80 percent of respondents regularly purchased some cowpea-based street food, and more than 70 percent regularly purchased *kosaï*. Almost half of respondents purchased *moin-moin* on the street and rice and beans.

Almost all cowpea products cooked at home are prepared from scratch. No respondent in the consumer survey reported buying cowpea flour or other cowpea-processed products. However, more than 80 percent of the same consumers reported buying processed cereal products, such as *semovita* or pasta.

"Supermarkets" or larger food stores in Kano mainly stock imported, packaged goods for a more up-scale market. This study found only two supermarkets in Kano that stocked dry-packed cowpeas. The JuJin Labu Store, near the new BUK campus, stocked "Simple Beans," which appear to be de-hulled cowpeas packed in Kano. The store is run by a Hausa businessman, and the clientele is mainly Hausa. A second store, Wellcare, stocks dry-packed blackeye peas from the United Kingdom and cowpeas that appear to be from the United States. Wellcare is run by a Lebanese businessman, and the clientele is mainly foreigners. Aside from a few restaurants specializing in traditional Nigerian food, few formal sector restaurants have cowpea-based foods on the menu. Only one supermarket visited by the study team stocked any cowpea-processed products, such as cowpea flour packaged in Lagos.

Figure 5: Cowpea Foods Prepared at Home



Source: "Person-on-the street" interviews.

INSTITUTIONAL CONSUMERS

Institutions in Kano State that feed large numbers of people also use cowpeas and could be potential markets for either industrial or informal cowpea processors and vendors. These institutions include boarding schools, hospitals, and prisons.

Boarding Schools

The Kano State Ministry of Education reports that its boarding schools have 42,819 students as of March, 13, 2007. The menu is uniform at all schools, determined by the Ministry of Education. Food items are purchased through an annual tender and awarded by the Kano State Ministerial Tenders Committee. Cowpeas are on the menu in Kano State boarding schools for 3 out of 21 meals per week: Sunday (*moin-moin* for breakfast); Tuesday ("beans porridge" (cowpea) for breakfast); and Thursday (*moin-moin* for breakfast). In 2006, the boarding schools used 5,427 bags (approximately 100 kg per bag) of cowpeas.

The Ministry of Education has an economic motivation to use processed cowpea grain because it can reduce labor costs and it is a low-cost protein substitute. Entry into this market would require convincing the ministry dieticians and administrators that the foods prepared are healthy and economical; and training the boarding school kitchen staff.

The Prison System

The Kano State Prison system has more than 2,000 inmates, similar to other state prison systems in Nigeria. Food ingredients are provided to prisons by nation-wide annual contracts to the Nigeria Prison Service. Prisoners prepare the food, as cooking is part of rehabilitation. Prisoners are fed cowpeas 4–5 times per week, mostly in the form of cowpea porridge and rice and beans. *Kosaï* is served when the breakfast menu is "pap" (*koko* in Hausa; a thin gruel made of cereal grain). *Dan wake* and *moin-moin* are too difficult to prepare for a large group. The prison cooks have gasoline-powered mills to grind the cowpeas for *kosaï*.

An estimated 30 bags of cowpeas, or 2.2 kg per prisoner, are used each week at the Kano Central Prison, according to S. M. Argungu, Controller of the Kano State Prison System. If cowpeas are used at the same rate by other prisons in the Kano system, the prison system would be using five tons per week. If *kosaï* is served once per week, then the demand for cowpea flour would be about one ton per week.

Given that prisons have mills to grind cowpea flour and use unpaid prison labor for cooking, there is little incentive for these institutions to outsource these processes. The main savings associated with processed cowpeas would be a reduction in investment in equipment over the long run.

Hospitals

There are 36 state hospitals in Kano State with a 12,090 bed capacity, not counting incubators for premature infants; as well as LGA hospitals with an additional 3,603 beds; private hospitals; and the Aminu Kano Teaching Hospital.

Food decisions in the Kano State hospital system are decentralized. The state receives a food allowance from the federal government for hospital patients; the allowance is then passed to individual hospitals that determine the menus. Hospitals have an economic interest in using processed cowpea grain because it reduces labor costs and is a low-cost protein.

The greatest short-term potential for processed cowpea use is in general hospitals that have sufficient funding for all patient meals. Currently, these hospitals tend to make foods that are prepared with whole cowpeas (e.g., “beans” porridge) because of the labor required for *kosaï*, *moin-moin,* and *dan wake*. Some hospitals (e.g., Murtala Mohammed Hospital in Kano) would like to provide more cowpea-based foods but lack the resources. The private, semi-private, and teaching hospitals have the resources to provide cowpea-based foods, including those made from milled cowpea, but many of their patients are wealthier and have developed other food habits (e.g., tea and toast for breakfast).

Introducing cowpea flour to hospital food services in Nigeria would require convincing hospital food committees and medical and kitchen personnel of the safety and benefits of this product. Only a few hospitals have dieticians who could be approached. Hospital staff would need to be trained in preparation and use of the product.

Hospitals might be a potential market for either processed flour or finished products. If street vendors collectively organized to supply greater quantities of cooked foods, they might be able to expand markets based on selling to these institutions. The MARKETS Project could explore the networking of some of the larger and more established individual home processors/street vendors to determine whether there is a potential and interest for expansion. This interest is explored below through quantitative analysis.

A QUANTITATIVE ANALYSIS OF COWPEA VENDOR CHARACTERISTICS AND BUSINESS PROFITABILITY, CONSTRAINTS, AND EXPANSION PLANS

Cowpea vendors represent an important potential target group for the MARKETS program: they are all women, many from low-income groups, and their employees are usually family members. A survey was given to 62 randomly selected vendors to collect detailed information on individual and household characteristics and business profitability, constraints, and plans for expansion. A summary of the findings is provided here with the statistical results in Appendix C.

PROFITABILITY

A regression equation was estimated to explore hypotheses of the determinants of profitability (i.e., net returns to entrepreneurial labor and management (calculated as gross revenue minus costs) (see Appendix C). The explanatory variables included individual characteristics such as experience and education, as well as aspects hypothesized to affect profitability such as entrepreneurial input. The number of employees, quantity of cowpeas, and cost of ingredients were included to capture the scale of the business.

The profitability analysis suggests that the businesses operating at a greater scale (i.e., having more employees and processing more cowpeas), earn more per input. There might be greater returns to scale for the business. Importantly, if the entrepreneur sells the product, profits tend to be greater. This suggests that while women in Islamic seclusion might operate successful businesses, they give up some profits by turning sales over to others. Neither experience nor education is a strong predictor of profitability, although having a Western education suggests lower profitability. There might be a selection bias, as the best students with a Western education will go to other occupations.

In summary, cowpea vending is a profitable business, and greater marginal profits could be achieved by enlarging the scale of operation.

CONSTRAINTS

To better understand the constraints facing *maikosaï* in Kano State, logistic regression analysis was used to test the relationship between the constraints identified by the cowpea vendors and demographic explanatory variables. The three most commonly identified constraints were lack of capital, lack of customers, and concern for security. A Logit equation was estimated for each. Three additional variables were added to these equations: (1) if cowpea processing was the major source of income; if commerce was the major source of income; and if the vendor sold mainly to neighbors.

The estimated model was a good fit for lack of capital but not for the other constraints. The analysis of determinants of lack of capital suggest that *maikosaï* with a higher education (e.g., those from wealthier families) and those with more experience in business report fewer capital constraints. However, the "quantity of cowpea" variable is positive, indicating a greater propensity to report a capital constraint as more cowpea grain is processed. Although the evidence is not consistent, there might be a group of cowpea vendors who are conducting a successful business and would like to expand but are faced with financial constraints. This result is worthy of further investigation, as the MARKETS Project is seeking to assist entrepreneurs along the value chain.

EXPANSION

The cowpea vendors were also asked whether and how they expected to expand their businesses. Four alternatives were presented: (1) keeping business as usual; (2) expanding facilities (e.g., sunshade); (3) expanding the product line (e.g., yam fries); and, (4) hiring more workers. Logit regressions were estimated to test hypotheses of determining variables for these expansion plans (full results are available in Appendix C). Explanatory variables for these equations included (1) produce *kosaï*, (2) produce rice and beans; (3) sell boiled cowpeas. Additionally, cowpea vendors were asked whether the main source of family income is agriculture or commerce.

Only one alternative from among the four was a good fit under the model to expand business (hiring more workers). The most likely expansion for these entrepreneurs would be to hire additional labor; the other expansions require either more external inputs or a change in technology. Education, both Western and Koranic, was associated with intent to hire more workers. The seclusion variable was not statistically significant, but the sign (positive) indicates that hiring workers was more likely to be a strategy proposed by women in seclusion.

Unfortunately, the analysis does not provide strong evidence as to the determinants of plans for expansion. These variables might have identified characteristics by which the MARKETS Project could target female entrepreneurs. There is an indication, though, that seclusion does not preclude entrepreneurial activity by women. This result is not surprising, as it has been supported by previous studies in the area for many years.[77] Future research should address whether these women have the capacity to expand their businesses or whether the businesses have already approached a scale beyond which they cannot be expanded.

CONCLUSIONS AND RECOMMENDATIONS

Cowpea vending is an important economic activity in Nigeria and in Kano, especially for generating income for poor families. The cowpea value chain in Kano State is still dominated largely by small-scale businesses from production through to processing, and cowpeas are produced almost exclusively by smallholder farmers. The milling of cowpeas and vending of cowpea-processed foods (largely street vending) provide income to several segments of poor families, particularly widows and divorced women. Furthermore, cowpeas represent an important source of protein for poor households.

Improving the cowpea value chain has the potential to result in pro-poor benefits. With the exception of Kano grain wholesalers, most actors in the cowpea value chain, particularly producers and informal vendors, are poor. Along the value-chain, women represent the greatest percentage of processors, although the actual number of women involved in farming is probably larger. All the vendors of cowpea-based street foods encountered in Kano State were female, and close to 25 percent of those interviewed derive total household income from the processing activity. Improving the profitability of cowpea vendors is a pro-poor intervention.

There are several points in the cowpea value chain that offer opportunities to increase returns to the actors, particularly poor and disadvantaged groups, including women. The recommendations range from working with cowpea varieties to developing market linkages. The MARKETS Project is currently pursuing interventions in some of these areas.

RECOMMENDATIONS

The primary objective of interventions should be to assist those with poor returns to improve or expand their business activities. Central components should be increasing education and skills, fostering organizational innovation, and adopting appropriate technology. The following recommendations identify areas of intervention with the potential to reduce gender inequalities and increase returns to the poorest, many of whom are women. Although strong cultural and religious practices influence the segregation and division of labor among men and women, it is important to explore a wide range of options.

REDUCING BARRIERS TO INCREASED RETURNS TO PRODUCTION

- Farmer education and training. As farming in the Kano area develops, smallholder farmers, both men and women, will only survive if they have the skills to compete, as well as farm management expertise through extension services. The evidence indicates that Kano women are owning and managing more farmland than in the past; and, in turn, this indicates that the acceptance of women's rights to inherit land and houses under current Islamic law is increasing. An in-depth analysis of gender roles in farming systems is necessary to determine how interventions, such as farmer education and training, could account for a shift in roles and increase benefits to women and men. In addition, given the importance of cowpeas in household consumption, the analysis should

explore the impact of the shift in roles on household food security and decisions concerning the production and marketing of cowpeas.

- On-farm cowpea storage. Although women might or might not apply chemicals on most farm compounds, they might play an important role in determining the practices of on-farm storage. Storage messages might be more effectively targeted if women are included in the process. Female extension agents could be useful in helping to reach an increased number of women in some areas.

FOSTERING THE INDUSTRIALIZATION OF COWPEA PROCESSING

- Several firms in Kano are interested in milling cowpeas but have not been successful to date. One principal constraint for these firms is the length of time it takes to obtain certification required by the government. An analysis of the standards and certification process to create a more conducive business environment might facilitate the development of these firms.

- If industrialization does occur in cowpea milling or processing, it is important to consider the constraints to women's participation in the public arena. Women have moved into industrial processing in many countries, with accommodation for different cultural norms and practices. A gender analysis may help identify and design interventions that improve women's participation in industrial cowpea processing.

INCREASING RETURNS TO INFORMAL COWPEA PROCESSORS AND VENDORS

- Cowpea street food vendors need to acquire more sophisticated business skills. The expansion of their product line to include other foods is one possibility. Better production and sales facilities (e.g., a bench, shed, or building) might help. Vertical integration with cowpea processing (informal or industrial processing) might reduce labor requirements.

- Informal cowpea processors could benefit from networking organizations for the demonstration of equipment, product development, and marketing. In India, organizations of street vendors and self-employed women have been successful in expanding business, surmounting credit barriers, and negotiating with government (see www.wiego.org). Women who produce cowpea-based foods could be encouraged to form groups to enter into the business of making cowpea flour or servicing larger market outlets. To include the largest number of cowpea processors and vendors, cultural and religious norms should be considered in conducting outreach.

- The industrial processing of cowpea flour has potential to benefit informal cowpea processors and vendors through the varied use of cowpea flour and the potential nutritional impact of the increased consumption of protein-rich products by consumers. The MARKETS Project should continue to support the development of the processing sector.

- The MARKETS Project's focus on industrial processing could marginalize informal cowpea processors; industrially processed cowpea products could

actually reduce the informal sector's customers. The major barrier to assisting informal processors is that they are spatially dispersed and do not have a professional association. Almost all the informal processors are women, and many of them practice seclusion. One way for the MARKETS Project to target and communicate with women, particularly poor women, might be to develop a cooperative approach for groups of informal processors to use cowpea flour and buy inputs.

- Identifying some specific cowpea characteristics desired by processors and consumers could increase profits for farmers and ultimately the processors as well. These characteristics might include ease of removal of the *hilum* and *testa*, increase of flour yield, improvement in taste, and reduced cooking time (an important characteristic for women who are involved in food preparation).

As the Nigerian economy develops, formalization of the cowpea value chain can be expected. Smallholder farms might be consolidated—a global trend in agricultural sectors. Mechanical grain handling facilities will likely deal with greater volume and be managed by marketing organizations. Street food vending, with demands for food safety and consistency, will likely transform into a fast food sector, based on the model in Europe and North America. This formalization process will probably take many years.

Overall, increasing women's returns in the cowpea subsector in Kano State, Nigeria, depends on identifying interventions that are culturally and religiously acceptable. Economic and demographic pressures might change the gender segregation of economic activities and increase women's returns; or innovative means, such as advanced technology, might increase their returns without a change in gender segregation. For international development organizations, the question is whether to help women innovate within the cultural and religious limits that they set for themselves, encourage them to modify those limits, or be observers.

APPENDIX A: GLOSSARY

Cowpea—*Vigna unguiculata*—a legume that is widely grown as a crop in the semi-arid tropics. In the United States, it is often called “blackeyed pea,” because the most common varieties are white or tan with a dark hilum. In West Africa, cowpeas are grown mainly for the seed, but the leaves are also used as a green leafy vegetable.

Dan Wake—a dumpling traditionally made by wet-milling cowpeas and mixing in dried baobab leaves to make a stiff batter. The batter is formed into balls and cooked in boiling water. Usually, *dan wake* is eaten as part of a meal.

Mudu—a volume measure commonly used in Kano markets. A mudu of cowpeas is about 2.5 kg.

Kosaï—a fritter traditionally made by wet-milling cowpeas, whipping the batter to incorporate air, and then deep frying the batter. Onions, peppers, and various spices might be added to the batter. Also known as “akara” in coastal parts of West Africa. Often eaten for breakfast or as a snack.

Kulu Wake—cowpeas boiled in water that is absorbed in cooking; only potash is added to the pot.

Maikosaï—Hausa for “maker of *kosaï*.” Since *kosaï* is the most common cowpea-based street food, *Maikosaï* is sometimes used to refer to all vendors of cowpea-based street food.

Moin-Moin—a “pudding” made by steaming a batter made with wet-milled cowpeas; usually eaten as the protein component (i.e., meat substitute) of a meal, with a carbohydrate and a sauce or condiment.

Naira—the Nigerian currency.

APPENDIX B: LIST OF INTERVIEWS

Producers

- Mandakanci—Five farmer interviews
- Gworzo/Lakawaya—Six farmer interviews; one women's farmers' group

Consumer Institutions

- *Hospitals*—Shehu Hashim, Director of Administration and General Service, Kano State Hospitals Management Board; Dauda S. Kanawa, Director of Hospital Services; Mariam Ibrahim Mudi, Assistant Catering Officer, Aminu Kano Teaching Hospital; Dr. M.D. Shehu, Abdullahi Wase Specialist Hospital; Ali Adamu, Kano State Hospital Board Zonal Director for Zone 5; Dr. S.W. Sani, Chief Medical Officer, Murtala Mohammed Hospital
- *Prisons*—S.M. Argungu, Controller of Kano State Prison system
- *Schools*—Ms. Bilkisu A. Waziri, Principal; and Anu Musa, Dala Agriculture Teacher, Dala Government Girls College

End Consumers

- Kano and Minjibir LGA: 48 persons

Industrial Food Processors

- Dan Tata Foods—Yusef Maigari, General Manager
- Foodpro-Serve—Abubakar Khalil, Owner
- White Gold—Ibrahim Abdulqadir, Sales Director
- Hala Global Services—Amina Dutse

Formal Sector Retail Food Entrepreneurs

- Al-Amir Restaurant
- Mr. Biggs fast food establishment
- Fahad Restaurant
- Salimatu Restaurant
- Zango Stores
- Sahad Stores
- JuJin Labu Store
- Wellcare Supermarket
- Flamingo Supermarket

Grain Merchants

- Ahmed Imam, Secretary, Dawanau Market Association
- Alhaj Abdoulaye Kouye, President, Dawanau Market Association
- Four grain merchants

Informal Processors (*makosai*)

- 62 vendors

APPENDIX C: STATISTICAL ANALYSIS OF COWPEA VENDOR (*MAKOSAI*) BUSINESSES

Of the 62 cowpea vendor interviews, 47 had data complete enough to use in the statistical analysis. Data were collected in Kibiya town, the LGA's administrative center where Madakanci is located, about 30 km from the Kano City center; and Gworzo, the LGA's administrative center where Lakawaya is located, about 40 km away.

Several equations were estimated to increase information about the cowpea vendor businesses. Ordinary Least Squares (OLS) was used to provide insight on determinants of profitability; Logit analysis was used to illuminate the determinants of lack of capital, lack of customers, concern for security, and expansion in number of employees.

DESCRIPTIVE STATISTICS

A list of explanatory variables is provided in Table C.1. These are the descriptive statistics for the vendors. Table C.2 gives basic statistical data on the continuous variables. There is great variability for many of the variables. Experience ranged from less than one year to 40 years. The average number of employees was one but varied from 0–7 employees. The average amount of cowpeas used by vendors in the regression analysis was 5.35 kg per day, ranging from less than 1 kg to almost 29 kg. The entrepreneur averaged 28 hours of work per week, ranging from 6–70 hours. Ingredient cost averaged 833 *Naira* per day, ranging from 10–2,815 *Naira* per day. About 45 percent of the vendors personally sold their products on the street. Almost 75 percent of the vendors had a Koranic education, and about 28 percent had a Western education. Five vendors out of the 47 total had both Koranic and Western educations.

Table C.1: Explanatory Variables

Variable Name	Definition
Years selling	Number of years vendor has been selling cowpea products
Who sells	1 = vendors sells herself; 0 = other sales person 1/
Koranic	1 = Koranic school education; 0 = no Koranic education
Western	1 = Western school education; 0 = no Western education
Number of employees	Number of employees reported of any age
Quantity of cowpea	Quantity of cowpeas used per day in kilograms
Ingredient cost	Niara/day of cowpea ingredient
Hours/week	Number of hours worked per week by vendor herself
Cowpea processor	1 = cowpea is main family income source; 0 = other source
Merchant	1 = commerce is the main family income source; 0 = no
Neighbors	1 = sells primarily to neighbors; 0 = sells to others
Agriculture	1 = agriculture is main family income source; 0 = other source
Kosai	1 = sells primarily kosai
Rice and cowpea	1 = sells primarily rice and cowpeas
Boiled cowpea	1 = sells boiled cowpeas; 0 = does not sell boiled cowpeas

1/ If another person sells for the vendor, the woman is usually in seclusion.

Table C.2: Descriptive Statistics for Continuous Variables

Variable	Mean	Minimum	Maximum	Standard Deviation
Return to labor and management (*Naira*/day)	2,057	-775	15,632	2,597
Years selling cowpea products	11	0	40	9
Number of employees	1	0	7	2
Quantity of cowpeas/day	5.32	0.94	28.75	5.10
Entrepreneur hours/week	28	6	70	14
Ingredient cost (*Naira*/day)	833	10	2,815	639

PROFITABILITY OF COWPEA VENDORS: REGRESSION ANALYSIS

Profitability regression equations, with cowpea vendor profitability as the dependent variable, were estimated to better understand the factors that influence business profitability. Profitability was calculated as the net return to entrepreneurial labor and management or gross revenue minus total reported costs. Costs included (1) ingredients, (2) number of laborers multiplied by a wage of 60 *Naira* per day, and (3) amortization of durable equipment on a straight line depreciation. The average net return for the 47 vendors was 2,057 *Naira* per day. However, the net return varied from a loss of 775 *Naira* per day to a profit of 15,632 *Naira* per day. Compared with the Kano State minimum wage of 7,200 *Naira* per month, it appears that some vendors generate substantial earnings from their business.

The baseline regression model (see Table C.3) has an R^2 of 56 percent and an adjusted R^2 of 47 percent. The F statistic is highly significant. Six of the nine independent variables in the baseline model are significant at the 10 percent level. The variables “years selling”, “who sells”, “number of employees”, and “hours/week” are statistically significant at the 5 percent level. “Quantity of cowpea” and “Western education” are significant at the 10 percent level.

Table C.3: Results of the Profitability Regression

Regression Statistics	
Multiple R	0.75
R Square	0.56
Adjusted R Square	0.47
Standard Error	1895.56
Observations	47

ANOVA

	df	*SS*	*MS*	*F*
Regression	8	173617231.1	21702153.89	6.0398
Residual	38	136539289.1	3593139.187	
Total	46	310156520.2		

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-338.17	1054.02	-0.32	0.75
Years selling	-113.09	40.80	-2.77	0.01
Who sells	2154.71	684.90	3.15	0.00
Koranic	-50.11	787.70	-0.06	0.95
# of employees	1009.49	214.31	4.71	0.00
Q. of cowpeas	139.12	71.22	1.95	0.06
Hours/week	50.44	23.85	2.11	0.04
Ingredients	-0.70	0.53	-1.30	0.20
Western edu.	-1354.10	779.57	-1.74	0.09

COMMONLY IDENTIFIED PROBLEMS FOR VENDORS: LOGISTIC REGRESSION ANALYSIS

To better understand the constraints facing *maikosaï* in Kano State, logistic regression analysis was used to test the relationship between the constraints identified and demographic explanatory variables. The three most commonly identified constraints were lack of capital, lack of customers, and concern for security. A Logit equation was estimated for each.

In addition to the previously defined education (Western and Koranic), experience (years selling), Islamic seclusion (who sells), and business scale variables (number of employees, quantity of cowpeas) variables, the following variables were used in the Logit analysis of *maikosaï* constraints:

- *Cowpea Processor:* If cowpea processing is the major source of family income = 1; If no = 0.
- *Merchant:* If commerce is the major source of family income = 1; If no = 0.
- *Neighbors:* If the *maikosaï* sells mainly to neighbors = 1; If no = 0.

The estimated model was a good fit for lack of capital but not for lack of customers or concern for security (see Table C.4). The Chi square test was highly significant for the lack of capital equation but not for equations with the dependent variables of lack of customers or insecurity.

LACK OF CAPITAL

For the lack of capital Logit analysis, the "Western education" variable has a statistically significant negative coefficient, suggesting that participation in Western education reduced the probability that a *maikosaï* would mention lack of capital as a major constraint. The "Koranic education" variable is also negative and statistically significant at the 10 percent level. The negative effect of Western education is probably not because those vendors with Western education had greater access to formal sector credit; only three *maikosaï* reported bank loans as the major source of capital for launching their businesses. All three of those vendors attended Koranic schools. It is possible that those women who had some Western education came from somewhat more prosperous families and hence had more savings and family resources.

Table C.4: Logit Regression for Selected Problems Identified by Kano Maikosaï

Explanatory Variables	Lack of Capital	Lack of Customers	Insecurity
Western	-3.8671**	0.9390	-1.3187
Koranic	-2.4970***	0.8383	-0.1094
Years selling	-0.3519*	0.0392	-0.0435
Who sell	-1.2911	-0.2473	-0.1515
# of employees	1.3468	-0.3223	-0.2300
Cowpea quantity	0.3953**	0.1109	-0.0613
Cowpea processor	-2.2175	-0.8909	-0.6289
Merchant	-7.4352*	0.7281	0.0410
Neighbors	2.0264	-0.8834	-1.7189
Constant	2.64627	-1.1637	0.7554
N	62	62	62
Wald Chi^2	28.32*	9.45	4.84
Pseudo R^2	0.4646	0.1098	0.1363

"*" = Statistically significant at the 1 percent level
"**" = Statistically significant at the 5 percent level
"***" = Statistically significant at the 10 percent level

Experience in the business (years selling) had a negative and statistically significant coefficient. This result suggests that those with more experience are less likely to report a lack of capital. Islamic seclusion does not seem to make vendors more likely to complain of lack of capital; "who sells, the Islamic seclusion variable, is not significantly different from zero. Business scale, as measured by quantity of cowpeas processed per day, has a positive and statistically significant effect on the probability of reporting a lack of capital.

Vendors who come from families in which commerce is the main source of income (Merchant) are less likely to report a lack of capital. Vendors from a family in which the main source of income is cowpea processing did not have a statistically significant effect on the probability of reporting lack of capital.

EXPANSION PLANS BY VENDORS

To better understand the *maikosaï* expansion plans if some of the constraints on their businesses could be lifted, separate Logit models were estimated for those vendors who indicated they would make the following business decisions:[78]

- Increase profits but maintain "business as usual"
- Improve facilities (e.g., bench for clients, sun shade)
- Add additional products (e.g., yam fries)
- Hire more employees

Independent variables that were not defined for either the profit equations or the previous Logit analysis included the following:

- *Kosaï*—1 if sells *kosaï*, zero otherwise
- *Rice and cowpea*—1 if sells rice and cowpeas, zero otherwise
- *Boiled cowpea*—1 if sells boiled cowpeas, zero otherwise
- *Agriculture*—1 if main source of family income is agriculture, zero otherwise

The estimated Logit model works best for "hiring more employees" (see Table C.5). The Chi^2 is statistically significant only for the hiring equation. The only statistically significant coefficients are also in the hiring equation. Both education variables are positively related to hiring more employees. The "Western education" coefficient is statistically significant at the 1 percent level and the "Koranic education" coefficient is significant at the 10 percent level. Neither experience in the cowpea-based business, nor the Islamic seclusion coefficient is statistically significant. Selling boiled cowpeas is positively and significantly related to hiring more employees.

Table C.5. Logit Analysis of Maikosaï Expansion Plans

Explanatory Variables	Business As Usual	Expand Facilities	Expand Product Line	Expand or Hire Workers
Western	-0.2387	-0.4247	1.0172	3.4780*
Koranic	0.0419	-0.2431	0.7014	3.5467***
Years selling	-0.0386	-0.0131	0.0439	0.0233
Who sells	-1.0869	1.2468	0.4894	-0.8296
Kosai	1.9119	-1.8756	-1.2242	1.9908
Rice and cowpeas	0.4678	-1.3672	0.4789	0.1412
Boiled cowpeas	0.7499	0.7871	-0.6643	3.3223*
# of employees	-0.5527	0.5976	0.1873	-0.0346

Agriculture	0.4049	-0.9361	0.6147	2.0284
Merchant	-0.0681	-0.6719	0.4437	1.3857
Constant	0.8899	-1.2937	-2.2514	-7.7062*
N	62	62	62	62
Wald Chi^2	0.27[1]	9.33	6.2	28.94*
Pseudo R^2	0.4646	0.1450	0.0929	0.2873

* = Statistically significant at the 1 percent level
** = Statistically significant at the 5 percent level
*** = Statistically significant at the 10 percent level

SIGNIFICANCE OF THE RESULTS

"Who sells" has a large, positive estimated coefficient, supporting the hypothesis that entrepreneurs who are more involved in selling their products earn more. Vendors who sell their own products earn, on average, 2,154 *Naira* per day more than those who send someone else out to sell. This suggests that while women in Islamic seclusion can operate successful businesses, they might sacrifice profits for being in seclusion.

"Western education" has a negative coefficient—not supporting the hypothesis that these women would run more profitable businesses. It is possible that cowpea-based enterprises do not require the skills of reading, writing, and arithmetic; and therefore, these skills are not a competitive advantage. Another interpretation is that Western education creates expectations that reduce the ability of the woman to compete in the informal sector cowpea-based business. For example, if Kano State girls with Western educations expect jobs as office workers, they might not be motivated to succeed in an alternative occupation, such as cowpea vending. Alternatively, there might be a selection bias; many of the best students in Western education go into formal sector employment. Those students that do not perform as well are more likely to end up doing informal sector work, like cowpea vending.

The "Koranic education" variable is not statistically significant from zero. This analysis (and other equations below) does not support the belief that Koranic education improves entrepreneurship. The estimated coefficient for the "number of employees" is statistically significant and positive. Entrepreneurs earn an average of 1,009 *Naira* per day, per employee, after paying the employee the reported wage of 60 *Naira* per day. The "quantity of cowpeas" variable was positive and statistically significant at the 10 percent level. Entrepreneurs earn about 139 *Naira* per day per kg of cowpea processed, after paying 46 *Naira* per kg for the cowpea. Both the "number of employees" and "quantity of cowpea" variables suggest that the scale of the enterprise does matter. Those that process more cowpeas and have more employees earn more. The "ingredient costs" coefficient is negative but not statistically significant.

Sensitivity testing was done to determine the robustness of the baseline results. "Years selling," "who sells," and "number of employees" have a consistent sign and statistical significance in a wide variety of models. The "Koranic education" variable is positive but not significant in most models. "Western education" usually has a negative coefficient, but the statistical significance varies from model to model. The signs of "quantity of

cowpeas," "hours/week," "ingredients," and "ingredient costs" are quite consistent from model to model but significance varies.

Limitations of this analysis include the relatively small sample size and the fact that this is a "one-shot" survey, suggesting that a larger sample size and more in-depth knowledge of the businesses would contribute to more reliable results. For example, if data collection were part of a program to work with *maikosaï* to help them use new technology and earn more, the data collected would also probably be of higher quality.

APPENDIX D: LOGISTIC REGRESSION

To better understand the constraints of *maikosaï* in Kano State, logistic regression analysis was used to test the relationship between the constraints identified and demographic explanatory variables. Greene provides a detailed explanation of Logit methods.[79] The mathematical form of the Logit model is as follows:

$$P_i = \Pr ob(Y_i = 1 | X) = \frac{1}{1 + e^{-(\alpha + \beta 1 x_1 + ... + \beta_k x_k)}}$$

Where: P_i = probability that the dependent variable is 1
Y_i = 1 if a given problem identified, zero otherwise
X = matrix of explanatory variables, n x k
e = base of natural logarithms
α, β = coefficients

NOTES

1. Hill, *Drygrain Farming Families*; Zakaria, *Entrepreneurs at Home*.
2. The project was awarded in mid-2005 and is being implemented by a consortium led by Chemonics International.
3. Based on "The Potential Effect of Economic Growth and Technological Innovation on Women's Role in the Cowpea Value Chain in Kano State, Nigeria" by J. Lowenberg-DeBoer and Germaine Ibro (2008).
4. MARKETS Project, *Newsletter*.
5. MARKETS Project, "Cowpea: Fact Sheet."
6. MARKETS Project, "Cowpea: Fact Sheet."
7. In the early 19th Century, the Jihad of Usman dan Fodio established the current Fulani Emirate. The British forces conquered Kano in 1903. Nigeria gained its independence in 1960. The modern state of Kano was created in 1967, but in 1991, that area was divided into the current Kano State and the new state of Jigawa. The current Emir is Alhadji Ado Bayero. While Nigeria is a democracy, the Emir retains substantial prestige and moral authority in Kano State.
8. Kano has long been a center of Islamic scholarship and religious fervor. The overwhelming majority of Kano residents are Muslims, mostly following Sunni teachings; and there is a very small minority of Christian immigrants. In 1999, following the lead of other northern Nigerian states, Kano State passed into law some aspects of the Islamic Shari'a code, possibly as an attempt to restore an image of morality and integrity (Economist, 2007). Application of Shari'a in Kano has been uneven, but it has largely avoided extremism. There is a history of unrest in Kano that has been characterized as Muslim-Christian religious strife but could also be ethnic tension between northerners (mainly Hausa) and southerners (often Igbo).
9. Federal Republic of Nigeria, "Legal Notice."
10. Kano City includes the LGAs of Kano Municipal, Tarauni, Gwale, Fagge, Nassarawa, and Dala (Kano State Ministry of Health, 2007).
11. In addition to the Kano City LGAs, the central zone includes Ungoggo, Kumbotso, Gabasawa, Minijibir, Gezawa, Dawakin Kudu, and Warawa. Kano Municipal LGA encompasses the ancient walled city of Kano. Fagge LGA is the location of Sabon Gari ("New City" in Hausa), which has a large population of migrants from other parts of Nigeria. Dawanau Market is in Ungoggo LGA.
12. Zakaria, *Entrepreneurs at Home*.
13. Islamic law has continued to evolve. In 1923, the Emir forbad women from inheriting property (Pierce, 2003). A subsequent Emir reversed that policy in 1954. Both Emirs used Islamic interpretations to support their arguments. There is a debate about the source of seclusion, but, in the Kano area, it is almost universally thought of as a religious practice. There is also a debate whether seclusion is required by Islamic law or if the practice is more heavily influenced by Hausa cultural attitudes.
14. Werthmann, "The Example of Nana Asma'u."
15. See note 1 above.
16. See note 13 above.
17. Langyintuo and others, "Cowpea Supply and Demand," 215–231.
18. Most of the research has been conducted by three institutions: (1) IITA in Ibadan, Nigeria; (2) Bean/Cowpea CRSP (renamed Dry Grain Pulse CRSP in 2007), management office at Michigan State University, East Lansing, Michigan, U.S.; and (3) the Brazilian Agricultural Research Corporation (EMBRAPA), Brazilia, Brazil. The IITA in Nigeria is the international agricultural research organization with the global mandate for cowpea. The Bean/Cowpea CRSP links most of the U.S. universities, IITA, and national research organizations engaged in cowpea research in Africa. IITA and the Dry Grain Pulse CRSP produce most of the English language information on cowpeas (http://www.isp.msu.edu/crsp/). Brazil is the second largest cowpea producing country in the world, and EMBRAPA takes the lead for that country's cowpea research. This literature is not translated from Portuguese, so is not included in this document (http://www.embrapa.br/English/index_html/mostra_documento).
19. Hall and others, "Development of Cowpea Cultivars," 103–134; Singh and others, "Recent Progress in Cowpea Processing," 22–40.
20. Moussa, *Economic Impact Assessment*.
21. Diaz-Hermelo and others, "Impact of Cowpea Breeding," 407–423.
22. Boys, *Adoption and Economic Impact*.

23. For marketing, the term “grainshed” is analogous to a watershed. A grainshed encompasses the area from which grain flows to a consumption center.
24. See note 18 above.
25. Ibid.
26. FAO, “Agriculture Food and Nutrition,” Chapter 4.
27. National Bureau of Statistics, “Area and Production Figures.”
28. Unpublished data from the Kano Agricultural and Rural Development Authority (KNARDA) from Lowenberg-DeBoer (personal communication).
29. Hill, *Population, Prosperity, and Poverty*; Harris, “Farm-level Assessment,” 201–214; Harris and Yusuf, “Manure Management,” 319–332; Mortimore and Adams, “Farmer Adaptation,” 49–57; Alene and Manyong, “Farmer-to-Farmer Technology,” 203–211.
30. For example, the average rainfall at Kano City from 1988–2001 was 823 mm (32.4 inches), but varying from 354 mm (13.9 inches) to 1049 mm (41.3 inches) (Ahmed, no date).
31. Adams and Mortimore, “Agricultural Intensification,” 150–160.
32. See note 30 above.
33. Inaizumi and others (1999) show that 98 percent of Dandgana growers and 99 percent of Lautaye farmers planted cowpea. In Madakanci, about 50 percent of dryland crop areas had cowpea planted on it in the 2005 crop season (but varying from 27–100 percent). All farmers in Madakanci intercrop cowpeas with millet and sorghum. Two of the Madakanci farmers interviewed mono-cropped cowpea production.
34. Off-farm income in Madakanci averaged 36,000 *Naira* (US$288) per year, per household. In comparison, in Bunkure LGA, agricultural sales per farm were 100,000 *Naira* per year (US$800) and off-farm income was 50,000 *Naira* (US$400) per year (Dabi, 2004).
35. Ogungbile and others (1998) show an average of 673 kg/ha of manure and 80 kg/ha of NPK fertilizer used in Kano villages studied. The farmers at Tumbau studied by Harris (1998) all used fertilizer. Application rates varied from 0 to 75 kg/ha. Manure application in the Tumbau data averaged 4.3 tons/ha, but varied from zero to 17.5 tons.
36. Moussa (2006) reports that 96 percent of the farmers he interviewed in northern Nigeria used field insecticides on cowpea, with 2 or 3 applications most common.
37. Ogungbile and others, “Analysis of Constraints,” 1–8.
38. Tipilda and others, “Intra-household Impact.”
39. Usman dan Fodio encouraged the education of women in Islamic studies, and several of his daughters became Islamic scholars, but the movement which he led limited the role of women outside the family compound (Werthmann, 2005).
40. In Madakanci, which is on the outer edge of the KCSZ, wives were involved only in threshing (four of the five cases), which can be done in the family compound. In two of these families, girls helped with planting, and girls and older women helped with harvesting. In Lakawaya, which is outside the area usually defined as the KCSZ, wives were more involved in crop tasks: planting, harvesting, and threshing or winnowing.
41. http://www.wofan.org.
42. Lowenberg-DeBoer and others, “Kano State Cowpea Subsector.”
43. The women plant IITA 277 or IITA 499-35. IITA 277 has a yield advantage, and IITA 499-35 is striga-resistant.
44. Fertilizer costs 2,500 *Naira* per bag, and insecticides cost 600 *Naira* per liter.
45. An IITA specialist accompanying the interviewees stated that IITA taught them to use the storage insecticides as an alternative to putting field insecticides on the stored cowpeas. Typically, bags are stored five to seven months, but some are stored up to 12 months. To control rodent damage, bags are placed on a low platform above rat poison.
46. Bello, “Family of Five Dies.”
47. Musa, *Marketing of Cowpea in Nigeria*.
48. The most commonly used air-tight containers are heavy plastic bags, but steel drums, plastic jugs, and other containers can be used when they are available and the price is affordable. In Senegal, Boys (2005) found that over 60 percent of cowpea production is stored using metal drums that are air-tight when properly used. Unfortunately, Boys (2005) and Moussa (2006) found that farmers do not consistently implement the CRSP non-chemical storage methods correctly. Some use insecticides as insurance in case there are air leaks in their containers. Many use containers that are difficult to seal air-

tight. The Bill and Melinda Gates Foundation recently funded a project with the goal of increasing the use of properly implemented hermetic storage to 50 percent of cowpea grain in 10 countries in West and Central Africa (Forbes, 2007).
49. See note 21 above.
50. Ibid.
51. Moussa (2006) reports that 38 percent of farmers store cowpeas using insecticides in single layer, non-hermetic bags. About 29 percent of farmers in his study store 79 percent of their production in double- or triple-layer heavy-duty plastic bags that can be hermetically sealed. About 76 percent of these farmers (using plastic bag storage) used insecticides regardless of whether the villages had received training in storage. About 15 percent of farmers store about 63 percent of production in metal drums. No insecticides were used on cowpeas stored in metal drums in villages that have had specific extension training in cowpea storage. The message that insecticide is not needed for hermetic containers seems to have been effectively communicated for metal drum use but not for bag storage.
52. The fundamental principle underlying this trade is that the drier areas of the Sahel have a comparative advantage in producing protein products, including from cattle, sheep, goats, groundnuts, and cowpeas; and the more humid areas near the coast have a comparative advantage in producing carbohydrates, including cassava, rice, and maize (Langyintuo et al., 2003).
53. See note 48 above.
54. See note 43 above.
55. See note 48 above.
56. Ibid.
57. One hundred grain weight is a commonly used measure of grain size.
58. See note 48 above.
59. Ibid.
60. Dolan and Sorby, “Gender and Employment.”
61. Cowpea-based foods are a common entrepreneurial activity in West and Central Africa. Several studies show that cowpea-based entrepreneurship is almost exclusively a women’s activity, and that in Niger and Nigeria, it can be quite profitable (Ibro et al., 2006; Bakori, 2007). In Niger, statistical analysis indicates that experience in cowpea-based entrepreneurship is positively related to profitability but that education (either Western or Koranic education) is not statistically significant (Ibro et al., 2006). In a study in Nigeria, Bakori (2007) shows that most of the informal sector cowpea processors and vendors are female (68 percent urban and 78 percent rural across 12 states). Men tend to be involved as the scale and formality of the business increases. For instance, most of the male processors were involved in informal sector restaurants located in permanent or semi-permanent sheds.
62. Hugon, *The Informal Sector*.
63. Pearce and others, “Generating an Income,” 385–400.
64. Due and others, “Constraints to Women,” 155–166.
65. Ibro and others, “Testing the Market.”
66. The term used for those women who make and sell *kosaï.*
67. In Bakori’s study in 2007, daily profits from the production and sale of *kosaï* varied from under 200 *Naira* to more than 1,000 *Naira*. All of the *kosaï* enterprises that experienced profits of more than 1,000 *Naira* per day were located in southern Nigeria. Bakori’s data on Kano indicated that all the *maikosaï* are earning less than 600 *Naira* per day. Statistical analysis in this study indicated that higher profits were associated with production of larger size *kosaï* (i.e., five *Naira kosaï* instead of the one *Naira* product), longer experience of the vendor, and cleanliness of the site.
68. In another study (Bakori, 2007), the most common cowpea product marketed by respondents was also *kosaï* (65 percent of urban respondents and 59 percent of rural respondents). The second most common product marketed was rice and beans (59 percent of urban respondents and 56 percent of rural respondents). *Moin-moin* was the third most common product (23 percent of urban respondents and 40 percent of rural respondents).
69. The Niger Bean/Cowpea CRSP surveys gave a similar age range (15–63, with an average of 38).
70. A *zakat* house is a Nigerian government agency that collects alms for redistribution to the needy.
71. Langyintuo and others, “Cowpea Supply and Demand,” 215–231; Musa, *Marketing of Cowpea in Nigeria*; Langyintuo and others, “Consumer Preference,” 203–213; Faye and others, “Impact of Sucrose,” 207–212; Mishili, *Cowpea Markets*; Jamal, *Consumer Preferences*; Ibro and others, “Testing the Market.”

72. Faye and others, “Impact of Sucrose,” 207–212; Ibro and others, “Testing the Market.”
73. Lambot, “Industrial Potential,” 367–374.
74. Bakori, *Econometric Analysis*.
75. The cowpea flour being used by the Niamey vendors is fine and is ground in plate mills; it is not the coarser, larger particle-size, hammer mill product being tested by the Bean/Cowpea CRSP (Fulton, 2006).
76. Recent Kano State cowpea production estimates are not available. Assuming production remains about 7 or 8 percent of Nigerian national production, Kano State production would be between 197,000 tons to 225,000 tons, annually.
77. Hill, *Drygrain Farming Families.*
78. For each alternative, if the respondent answered “yes,” the independent variable takes the value of one, and zero otherwise. Respondents could use more than one of the expansion alternatives (2, 3, or 4).
79. Greene, *Econometric Analysis*.

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